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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 16
AUGUST 15, 1976

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 16
AUGUST 15, 1976

W76-08101 -- W76-08750

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

2. WATER CYCLE

2A. General

ON-SITE RUNOFF DEPLETION AT THREE IMPOUNDMENTS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 4A.
W76-08122

COASTAL CIRCULATION AND PHYSICAL OCEANOGRAPHY OF THE SCOTIAN SHELF AND THE GULF OF MAINE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 2L.
W76-08125

SURFACE CIRCULATION PATTERN IN THE GULF OF ST. LAWRENCE,
Quebec Univ., Rimouski. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08126

SNOWMELT-RUNOFF MODEL FOR STREAM FLOW FORECASTS,
Eidgenoessische Institut fuer Schneeund Lawinenforschung, Davos (Switzerland).
For primary bibliographic entry see Field 2E.
W76-08131

ABOUT THE PROBLEM OF DIRECT RUNOFF DETERMINATION BY SEPARATION OF THE HYDROGRAPH COMPONENTS (K OTAZKE URCENIA PRIMAEHO ODTOKU SEPARACIOU PRIETOKOVYCH VLN),
O. Mendel.
Vodohospodarsky Casopis, Vol. 21, No. 3-4, p 335-350, 1973. 11 fig, 1 tab, 12 ref.

Descriptors: *Hydrographs, *Rainfall-runoff relationships, Base flow, Rainfall, Surface runoff, Groundwater, Storm runoff, Surface-groundwater relationships, Mathematical studies, Flood flow.

Presently there exist many procedures and methods for the separation of surface and groundwater runoff by hydrographs; however, the solutions are applicable only to those localities and geographical conditions for which they were derived. The effect of the runoff depths on the accuracy of the rainfall-runoff relationships has been determined using six methods of surface runoff separation with the rainfall-runoff relationships calculated on the basis of the parametric expression of its conditioning factors. From experimentation, the best conditioning factors were found to be: mean casual rainfall values; duration of the casual rainfall; mean relative air moisture ten days prior to casual rainfall; index of preceding rainfall ten days prior to casual rainfall; and index of the preceding discharges expressed as the initial discharge at the point of rise of the flood hydrograph. The results based on the total coefficient of correlation and all other statistical characteristics show that the closeness of rainfall-runoff increases with the increasing number of the conditioning factors up to the six and then re,aoms almost constant. The differences in the direct runoff determination by separation of the flood hydrograph components according to particular expressions of rainfall-runoff relationships and their statistical characteristics were not substantial and differences between mean values of the direct runoff, its standard deviations, and its total coefficients of correlation for the particular methods of the runoff depth determination were found to be negligible at the one percent significance level. (Sandoski-FIRL)
W76-08238

DERIVATION OF A MODEL RAIN FOR THE DIMENSIONING OF SEWER SYSTEMS (ENTWICKLUNG EINES BERECHNUNGSREGENS FUER DIE BEMESSUNG VON KANALNETZEN),
For primary bibliographic entry see Field 5D.
W76-08253

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III - VOLUME 1--DRY WEATHER FLOWS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08278

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 2, IMPACTS OF DUST STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
D. E. Bell, B. J. Claborn, R. M. Sweazy, R. H. Ramsey, and D. M. Wells.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 426, $4.50 in paper copy, $2.25 in microfiche. Final Report WRC-75-2, December 1975. 50 p, 1 fig, 10 tab, 28 ref. OWRT B-177-TEX(3).

Descriptors: *Urban hydrology, *Urban runoff, *Suspended solids, Storms, *Model studies, *Texas, Water quality, *Dust, storms.
Identifiers: Lubbock(Tex), Semi-arid areas, Sand storms.

The urban runoff model proposed by Austin to describe both quantity and quality of runoff was applied to a 1499 acre area. The model was then modified to include parameters related to sand/dust storm events. These parameters are: (1) Dust deposited in 10, 20, and 30 day intervals prior to precipitation event. (2) Dust in air during 10, 20, and 30 day intervals prior to precipitation event. The first parameter was based on wind speed observations during dust storms and the second on visibility during dust storms. Both linear and nonlinear relations were investigated. General applicability of the Austin model is questioned, as the predictive ability was somewhat limited. Inclusion of dust/sand parameters did not improve the model. (See also W76-08278).
W76-08279

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 3 - ANALYSIS OF FLOW MODELS,
Texas Tech Univ., Lubbock. Water Resources Center.
B. H. Bailey, R. H. Ramsey, B. J. Claborn, R. M. Sweazy, and D. M. Wells.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 427, $4.00 in paper copy, $2.25 in microfiche. Final Report WRC-75-3, December 1975. 24 p, 3 fig, 3 tab, 5 ref. OWRT B-177-TEX(4).

Descriptors: *Storm runoff, *Flow rates, Flow, *Model studies, *Texas, *Correlation analysis, Cities, Water quality, *Urban runoff, Watershed management, Peak discharge, Urbanization.
Identifiers: *Lubbock(Tex), Flow model comparison, Semi-arid areas, *Urban watersheds.

Runoff events from a 1499 acre urban watershed in Lubbock, Texas were monitored over a nine month period from September 1974 to May 1975. The observed peak flows and runoff volumes were compared to the outputs generated from 4 runoff models which used the precipitation records and watershed characteristics as inputs. Criteria for selecting the models used in the analysis were the time, money, and effort required for implementation. The following models were used: Rational; Viessman, Keating, and Srinivasa; Viessman and Miller, and the British Road Research Laboratory (RRL). For the study data, the Viessman, Keating, and Srinivasa Method yielded a correlation of .91 to best predict the total runoff from a precipitation event. The RRL Method had a correlation Co-efficient of .45 - the best in predicting the peak rates. By using observed flow volumes and peak rates of flow as reference values, the outputs from the various models were compared to determine how conservative the models were in predicting peak rates of flow and runoff volumes. The index numbers obtained for the volumes of runoff were: 4.51 for the Viessman-Miller Method; 2.83 for Viessman, Keating, and Srinivasa Method and 5.86 for the RRL Method. The index numbers obtained for the peak rates of flow were 12.82 for the rational method; 3.24 for the Viessman, Keating, and Srinivasa Method, and .86 for the RRL Method. (See also W76-08278)
W76-08280

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 4 - PROJECT SUMMARY,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08281

INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4A.
W76-08326

THE DEVELOPMENT OF A SNOW ROUTINE FOR THE HBV-2 MODEL,
Swedish Meteorological and Hydrological Inst., Stockholm.
For primary bibliographic entry see Field 2C.
W76-08338

HOW MUCH PRECIPITATION GOES TO INFILTRATION DURING A STORM PERIOD,
Karnataka Regional Engineering College, Surathal (India). Dept. of Mechanics and Hydraulics.
T. Babu Rao, G. Ranganna, and I. V. Nayak.
Nordic Hydrology, Vol. 6, No. 2, p 93-113, 1975. 14 fig, 1 tab, 15 ref, 1 append.

Descriptors: *Precipitation(Atmospheric), *Infiltration, *Storms, Storm water, Basins, Interception, Evaporation, Transpiration, Surface runoff, Winds, Land use, Soil moisture, Solar radiation, Watersheds(Basins).
Identifiers: Storm characteristics, Abstractions, Multi-correlations.

Storm characteristics and condition of a basin at the beginning of a storm were developed for a basin, based on a detailed investigation of factors influencing infiltration and functional relationships among the abstractions during a storm period. Graphical multiple correlations were also obtained for estimating the abstractions. Basin characteristics like area, slope and soil characteristics were treated as time-invariant. When abstractions during a storm period due to other causes were negligible, the sum of the abstractions could be approximated to infiltration during the storm period. For 10 basins with 60 storms, graphical multiple correlations were prepared for estimating abstractions. These correlations were verified using a different set of 112 storms in addition to the 60 storms used in the calibration phase. The results were discussed and five conclusions were made. (Roberts-ISWS)
W76-08339

WATER TEMPERATURE VARIATIONS WITHIN A MAJOR RIVER SYSTEM,
University of Strathclyde, Glasgow (Scotland). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-08340

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y.
For primary bibliographic entry see Field 7C.
W76-08507

URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Upper Darby, Pa. Engineering Div.
For primary bibliographic entry see Field 4D.
W76-08509

EFFECTS OF HYDROLOGIC REGIME ON MAGNITUDE AND FREQUENCY OF DOMINANT DISCHARGE,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-08514

THE GROUNDWATER OUTCROP-EROSION MODEL; EVOLUTION OF THE STREAM NETWORK IN THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Instituut voor Aardwetenschappen.
J. J. DeVries.
Journal of Hydrology, Vol. 29, No. 1/2, p 43-50, March 1976. 3 fig, 6 ref.

Descriptors: *Drainage patterns(Geologic), *Drainage density, *Erosion, *Base flow, *Hydrology, *Model studies, Geomorphology, Geologic control, Pleistocene epoch, Glacial drift, Groundwater, Surface runoff, Discharge(Water), Topography, Percolation, Infiltration, Permeability, Channeling, Ponding, Storage, Water table, Hydraulic gradient, Darcys law.
Identifiers: *Netherlands, *Groundwater outcrop-erosion model(GOEM), *Outcrops, Stream development, Stream order, Conceptual model, Bifurcation ratio.

The stream network in the higher, Pleistocene part of The Netherlands is genetically coupled with groundwater discharge systems of various extents. Streams of a given order can be explained as outcrops of groundwater flow systems of corresponding order. The drainage system is controlled by the precipitation surplus (climate), the resistance of the subsurface to groundwater flow (geology) as well as the previous relief and the incision depth (topography). This concept was defined as the groundwater outcrop-erosion model (GOEM). Stream nets can be synthesized theoretically from this model using geologic, geomorphologic and climatic data based on groundwater flow formulas and Horton's law on stream order vs. stream density. (Visocky-ISWS)
W76-08515

AN OPTIMIZATION TECHNIQUE ADAPTED TO USDAHL-74 REVISED MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
G. H. Comer, and W. H. Henson.
Water Resources Bulletin, Vol. 12, No. 1, p 139-146, February 1976. 2 tab, 9 ref.

Descriptors: *Agricultural watersheds, *Hydrologic systems, *Computer models, *Optimization, Soil surveys, Hydrology, Model studies, Soil moisture, Methodology, Watershed management.
Identifiers: *Search optimization routine, *Input parameters, System sensitivity.

USDAHL-74, revised model of watershed hydrology, treats a watershed as a distributed system. The input parameters are derived from available soil survey information, cropping patterns, topography, and general climatic conditions. To determine optimum parameters, a direct search optimization routine has been added to the model. The results indicated a more closely matching model output to observed data and illustrated the sensitivities of the parameters. The study showed that the solutions derived based on different objective functions were not radically different. The sensitivities of the model output to various parameter changes could be used to better understand the behavior of the model under various circumstances. (Singh-ISWS)
W76-08523

THE USE OF LIKELIHOOD FUNCTIONS TO FIT CONCEPTUAL MODELS WITH MORE THAN ONE DEPENDENT VARIABLE,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2G.
W76-08729

IMPLEMENTATION OF HYDROLOGIC MODELS AT GODDARD SPACE FLIGHT CENTER.
IBM Space Systems Center, Huntsville, Ala.
Available from the National Technical Information Service, Springfield, Va 22161 as N75 17766, $3.50 in paper copy, $2.25 in microfiche. Final Report, IBM No. 74W-00323, December 31, 1974. 7 p, 8 ref. NASA NAS5-20597.

Descriptors: *Model studies, *Simulation analysis, *Computer models, *Maryland, River basins, Remote sensing, Watersheds(Basins), Hydrologic data.
Identifiers: *Moisture-accounting flow, *Monocasy River(Md), *Patuxent River(Md), Stanford watershed model.

Two major watershed simulation models were implemented on the computer system at NASA Goddard Space Flight Center, Greenbelt, Maryland. The two hydrologic models - NASA-IBM model and the National Weather Service River Forecast System (NWSRFS)- had pleaviously been developed. Project activity consisted of: (1) acquisition of historical and physiographic data for two Maryland river basins (Monocasy River above Jug Bridge and Patuxent River near Laurel); (2) calibration of the NASA-IBM model and the NWSRFS to simulate the Patuxent River and Monocasy River basins, respectively; (3) implementation of both models on the computer system at Goddard Space Flight Center; and (4) instruction of Goddard personnel in model operation. Documents describing model concepts, operation and application were listed in references. In operation, the models implemented a moisture-accounting flow, distributing input (precipitation and snowmelt) among storages (vegetative interception, soil moisture, groundwater, snowpack, channel flow, overland flow), losses (evapotranspiration) and output (streamflow from the basin mouth where the stream gage was located). The models produced tabulations and plots of simulated and observed streamflow as well as statistical analyses and summaries. (Roberts-ISWS)
W76-08745

2B. Precipitation

ON A THERMAL LAG IN THE NORTH ATLANTIC OCEAN DURING A CLIMATIC CHANGE,
Ocean-Atmosphere Research Inst., Cambridge, Mass.
For primary bibliographic entry see Field 2L.
W76-08127

PARTICLE VAPORIZER,
Department of the Navy, Washington, D.C.
For primary bibliographic entry see Field 3B.
W76-08148

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 2, IMPACTS OF DUST STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08279

EXAMINATION OF THE CONCEPT AND USE OF THE STANDARD PROJECT FLOOD,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 8B.
W76-08321

LASER APPLICATIONS TO ATMOSPHERIC SCIENCES - A BIBLIOGRAPHY,
Old Dominion Univ., Norfolk, Va.
For primary bibliographic entry see Field 10C.
W76-08323

DESIGN OF AN EXPERIMENT TO SUPPRESS HAIL IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W76-08330

HOW MUCH PRECIPITATION GOES TO INFILTRATION DURING A STORM PERIOD,
Karnataka Regional Engineering College, Surathal (India). Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 2A.
W76-08339

THE ESTIMATION OF LOCAL RAINFALL BY SAMPLE GAUGING,
D. J. Hatch.
Weather, Vol. 31, No. 3, p 79-83, March 1976. 6 fig, 1 tab, 5 ref.

Descriptors: *Rainfall, *Networks, *Gaging, Precipitation gages, Data processing, Data collections, Measurement, Estimating, Precipitation(Atmospheric), Network design, Rainfall disposition, Meteorology.
Identifiers: *Error.

Although techniques are being developed to estimate the distribution and quantity of local rainfall by radar, ground-level networks of raingages remain the usual method of analysis. Such networks almost invariably represent a sample of recording points which are too scattered and uneven to reflect accurately the local distribution of rainfall upon which estimates of mean daily rainfall amount must be based. Networks of gages suffer both systematic and random errors, the former being related to the positioning of gages and the latter to the number of gages in the network. A method was outlined to illustrate how progressively increasing the numbers of gages in a network can alter the apparent distribution of rainfall and affect estimates of the mean fall, under different synoptic conditions and rainfall types. It seems that estimates of mean rainfall are reasonably accurate once gage density reaches one gageper 100 sq km but that distribution requires densities of at least one gage per 20 sq km to reflect local effects, and that considerably denser networks would be required for confidence in the distribution of intense local falls. (Sims - ISWS)
W76-08348

RAIN GAUGE,
J. Baer.

U. S. Patent No. 3,943,762, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1125, March 16, 1976.

Descriptors: *Patents, *Rain gages, *Instrumentation, Rainwater, Rainfall, Rainfall deposition, Electronic equipment.
Identifiers: Cummulative rainfall.

A rain gauge is comprised of a counter and a pivoted bistable receiver having two compartments and which is adapted to pivot between first and second limit positions. A collector operates to collect the rainwater and directs it into one or the other of the compartments depending upon where the receiver is positioned. When the operative receiver compartment accumulates a predetermined amount of water, for example water representative of one-tenth of an inch or rainfall, it pivots to the other limit position, placing the other compartment in the operative position, dumping the contents of the first compartment and actuating a counter which registers the increment of rainfall. The actuation of the counter is accomplished by applying an electrical pulse to the counter, the pulse being generated by the pivotal movement of the receiver. The pulse is generated by a sensor cooperating with and sensing receiver movement such as reed switch responsive over the middle range of its movement to a magnet carried by the receiver. Adjustable counterweight means are provided to adjust the balance of the receiver to enable accurate calibration of the gauge. (Sinha-OEIS)
W76-08397

EASTERN LAKE ONTARIO PRECIPITATION NETWORK,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
S. J. Bolsenga, and D. C. Norton.
NOAA TM ERL GLERL-5; GLERL Contribution No. 47; November 1975. 52 p, 7 fig, 36 tab, 1 ref, 6 append.

Descriptors: *Precipitation(Atmospheric), *Effective precipitation, *Precipitation intensity, Precipitation gages, Rainfall, Meteorology, Meteorological data, Hydrology, Hydrologic data, *Lake Ontario, Great Lakes, New York, *Networks.
Identifiers: Precipitation data, Precipitation measurement.

A six gage precipitation network was operated for a 5-year period in the eastern portion of the Lake Ontario basin. Descriptions of the instrumentation, site locations, and data reduction procedures and a complete listing of the data are provided. (NOAA)
W76-08412

A COMPARISON OF MANUALLY DIGITIZED RADAR DATA AND OBSERVED COOL SEASON PRECIPITATION OVER THE SOUTHERN APPALACHIANS,
National Weather Service, Fort Worth, Tex. Southern Region.
H. T. May.
NOAA TM NWS-84, Jan. 1976 10 p, 4 fig, 3 tab, 5 ref.

Descriptors: *Precipitation(Atmospheric), *Rain, *Sleet, *Snowfall, *Climatology, Meteorology, *Precipitation gages, *Radar, Mountains, *Appalachian Mountain Region, Estimating.
Identifiers: Observed precipitation, Precipitation estimates, Manually digitized radar(MDR).

A limited evaluation of observed precipitation and precipitation estimates utilizing manually digitized radar (MDR) values over the southern Appalachians and adjacent plains (foothills) was undertaken for the period mid-November 1973 through mid February 1974. Factors such as beam filling, range, precipitation tops, freezing level, terrain effects, frequency distribution of MDR data, and radar estimates of precipitation over mountain and plain are examined. (NOAA)
W76-08414

APPLICATION OF THE NATIONAL WEATHER SERVICE FLASH-FLOOD PROGRAM IN THE WESTERN REGION,
National Weather Service Salt Lake City, Utah. Western Region.
For primary bibliographic entry see Field 4A.
W76-08415

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
J. H. Wagner.
Report FR-807-40, Final Report, Phase I, February 11, 1975, 65 p, 16 fig, 1 tab, 2 append. Prepared for Bureau of Reclamation, Division of Atmospheric Water Resources Management, Denver, Colorado. BuRec 14-06-D-7551

Descriptors: Data collections, Precipitation(Atmospheric), *Telemetry, Data transmission, *Networks, *Meteorological data, *Data processing, *On-site data collections, *Remote sensing, Data storage and retrieval, *Precipitation gages, Gaging stations.
Identifiers: Microprocessors, Satellite data collections, Aircraft data collections, Digital sensors, Digital data recording, *Automatic data collection, ERTS data systems.

This report describes the development of two techniques for automatic collection of data from remote precipitation gages. Both techniques utilize a digital precipitation gage developed as a part of this program. The ERTS-RAIN concept is designed for a network of gages operating within a 12 mile radius of an ERTS Data Central. The Airborne-RAIN concept is designed for data collection from a network of gages operating over an area of several thousand square miles. Experimental systems were developed and tested in order to demonstrate the feasibility of both concepts. The ERTS-RAIN network provides very fine data resolution both in time and coverage area. The digital tape record at the Remote Data Central enables data to be transferred directly into a computer with a minimum of intermediate handling. The Airborne-RAIN network is most efficient when it is providing data over a wide coverage area with samples taken at a relatively low rate (30-or 60-minute intervals). Specific recommendations for implementation of prototype networks for evaluating the operational aspects of the network are included. (Bureau of Reclamation)
W76-08694

THE SIGNIFICANCE AND VARIATION OF ATMOSPHERIC NUTRIENT INPUTS IN A SMALL CATCHMENT SYSTEM,
Sheffield Univ. (England), Department of Geography.
For primary bibliographic entry see Field 5A.
W76-08728

RAINFALL AND FLOODS IN INDIA DURING 1974 SOUTHWEST MONSOON PERIOD,
Meteorological Office, New Delhi (India).
S. D. S. Abbi, M. R. Nagasubramanian, and P. K. Datta Roy.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 26, No. 4, p 435-441, October 1975. 1 fig, 3 tab.

Descriptors: *Rainfall, *Floods, *Monsoons, *Asia, Data collections, Climatic data, Depth-area curves, Flood data, Meteorological data, Weather data, Precipitation(Atmospheric), Meteorology, Climatology.
Identifiers: *India, 1974 rainfall, Southwest monsoon.

The rainfall during the 1974 southwest monsoon period was normal or above normal over northeast India, south Peninsula, Jammu and Kashmir, West Madhya Pradesh, Konkan and Goa and Madhya Maharashtra and below normal over rest of the country. The rainfall deficiencies over the deficit states were, however, between 20 and 40% except in Gujarat State where it remained scanty (-60% or less) throughout the period. The characteristic features of this year's monsoon were (1) the monsoon activity continued over most parts of the country beyond 30 September and the rainfall deficiencies in most of the deficit states were made up subsequently to some extent; (2) all time record rainfall of 58.0 cm occurred on 5 July over Bombay city (Colaba) and 450.0 cm for the month of September 1974 over Cherapunji; (3) a severe cyclonic storm crossed West Bengal coast near Contai on the afternoon of 15 August 1974, which is quite unusual for this time of the season; and (4) unprecedented floods ravaged south Kanara district of Karnataka and many districts of Kerala during 25 to 31 July 1974. (Sims-ISWS)
W76-08732

EXTREME RAINFALL STUDIES OF THE BRAHMANI, THE BURHABALANG, THE RUSHIKULYA AND THE SUBARNAREKHA RIVER CATCHMENTS,
Meteorological Office, New Delhi (India).
T. G. Changraney, S. K. Dube, and S. D. S. Abbi.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 26, No. 4, p 511-517, October 1975. 3 fig, 6 tab, 11 ref.

Descriptors: *Rainfall, *Excessive precipitation, *Probable maximum precipitation, Watersheds(Basins), Rivers, Precipitation excess, Depth-area curves, Depth-area-duration analysis, Precipitation(Atmospheric), Storms, Monsoons, Climatic data, Weather data, Meteorology, Climatology.
Identifiers: *India.

The rivers of Orissa region are prone to frequent floods during the southwest monsoon season, primarily because of the region lies in the normal track of monsoon depressions that originate in the Bay of Bengal and cross Orissa coast in course of their westerly to northwesterly direction of movement. With a view to estimating their maximum flood potential, it is necessary to find the maximum average rainstorm depth that has actually been realized in various catchments and to estimate the maximum rainfall that can probably occur in these catchments. For this purpose, the present study has been made and comparative appraisal made of the extreme storms rainfall depths thus arrived at. The present study was confined to the Brahmani, the Burhabalang, the Rushikulya and the Subarnarekha river catchments. (Sims-ISWS)
W76-08733

2C. Snow, Ice, and Frost

SNOWMELT-RUNOFF MODEL FOR STREAM FLOW FORECASTS,
Eidgenoessische Institut fuer Schneeund Lawinenforschung, Davos (Switzerland).
For primary bibliographic entry see Field 2E.
W76-08131

THE STUDY OF FRESH-WATER LAKE ICE USING MULTIPLEXED IMAGING RADAR,
Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
M. L. Bryan, and R. W. Larson.
Journal of Glaciology, Vol. 14, No. 72, p 445-457, 1975. 7 fig, 19 ref. NASA NAS 3-18239.

Descriptors: *Lake ice, *Radar, Great Lakes, *Lake Superior, Aircraft, *Remote sensing, Instrumentation, Iced lakes, Ice, Electrical properties, Microwaves, *Michigan.
Identifiers: Whitefish Bay(Mich), Straits of Mackinac(Mich).

The study of ice in the upper Great Lakes, both from the operational and the scientific points of view, is receiving continued attention. Quantitative and qualitative field work is being conducted to provide the needed background for accurate interpretation of remotely sensed data. The data under discussion in this paper were obtained by a side-looking multiplexed airborne radar (SLAR) supplemented with ground-truth data. Because of its ability to penetrate adverse weather, radar is an especially important instrument for monitoring ice in the upper Great Lakes. It has previously been shown that imaging radars can provide maps of ice cover in these areas. However, questions concerning both the nature of the surfaces reflecting radar energy and the interpretation of the radar imagery continually arise. The analysis of ice in Whitefish Bay (Lake Superior) indicated that the combination of the ice/water interface and the ice/air interface is the major contributor to the radar backscatter as seen on the imagery. At these frequencies the ice has a very low relative dielectric permittivity (less than 3.0) and a low loss tangent. Thus, this ice is somewhat transparent to the energy used by the imaging SLAR system. The ice types studied included newly formed black ice, pancake ice, and frozen and consolidated pack and brash ice. (Sims-ISWS)
W76-08138

EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7C.
W76-08147

ARCHING OF FRAGMENTED ICE COVERS,
Cold Regions Research and Engineering Lab., Hanover, N.H. Applied Research Branch.
D. J. Calkins, and G. D. Ashton.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A009 499, $3.50 in paper copy, $2.25 in microfiche. Special Report 222, April 1975. 16 p, 16 fig, 2 tab, 1 ref.

Descriptors: *Ice cover, *Rivers, *Model studies, *Hydraulic models, Flumes, Laboratory tests, Ice jams, Ice, Navigation, Structures, Hydraulics.
Identifiers: Ice floes, Ice blocks, *Arching, River ice.

A study of arching by fragmented ice floes across a gap in a surface obstacle was reported. The study included several series of experiments in a hydraulic flume in which simulated ice was released upstream of the surface obstacle at controlled rates and the occurrence or non-occurrence of the formation of a stable arch was observed. The threshold of arching was found to correlate well as a function of the supply rate of surface area of ice, the exit ice surface discharge at the gap, and the ratio of individual floe size to gap dimension. In a series of corollary experiments an arch, once formed, was subjected to a disturbance in the form of a vertical rod traversed longitudinally through the accumulation in the upstream direction. The quantity of ice released and the rate of release prior to another arch re-forming was determined. (Sims-ISWS)
W76-08149

ALTERNATIVE METHODS OF ESTIMATING SNOW WATER PARAMETERS,
Idaho Univ., Kimberly. Water Resources Research Inst.
D. L. Reese, H. F. Mayland, and C. E. Brockway.
Water Resources Research, Vol. 9, No. 5, p 1433-1439, October, 1973. 2 fig, 3 tab, 5 ref.

Descriptors: *Analytical techniques, *Snowmelt, Snow, Water equivalent, Estimating, Regression analysis, Idaho, Mathematical studies, Probability.
Identifiers: Recurrence, Snow water parameters.

A recurrence analysis technique using probability and contingency relationships of snow depth, water equivalent, and snow density is presented. Three methods of estimating snow water parameters at a given site by recurrence and the presently used regression techniques are based on the value from the previous month at the site; the value from a reference site and the month to previous month contingency parameter of the reference course. The recurrence technique, Pearson type 3, was tested on three central Idaho snow courses and was most useful when the third method was used to estimate snow depth and either of the first two methods was used to estimate the water equivalent. Correlation of estimated values to measured values indicated equal reliability of recurrence and regression analysis when the three methods were used. The recurrence technique can be used successfully in estimating snow water parameters and their probability of occurrence. (Sandoski-FIRL)
W76-08259

EVALUATION OF GLACIER MASS BALANCE BY OBSERVING VARIATIONS IN TRANSIENT SNOWLINE POSITIONS,
Norwegian Water Resources and Electricity Board, Oslo.
G. Ostrem.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-26469, $3.50 in paper copy, $2.25 in microfiche. Report SR No. 376, Fall 1974. 9 p, 3 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Glaciers, *Snow cover, Satellites(Artificial), On-site investigations, Snowmelt, Melt water, Water resources, Rivers, Hydrology, Glaciology.
Identifiers: *Transient snowlines, *Norway, *ERTS, Mass balance.

During this experiment only a very limited number of scenes were obtained, mainly due to weather conditions (mountain areas in Southwestern Norway are often covered by clouds of various kinds). However, the transient snowline on five outlet glaciers from the Jostedalsbreen ice-cap in Southwestern Norway could be determined from ERTS image No. 1336-102060, when bands MSS 5, 6 and 7 were combined in an additive color viewer. The snowline was situated at a very low altitude at the time of imagery (June 24, 1973) indicating that glacier melt was behind normal schedule, a fact that has a hydrologic bearing: one could expect less melt water in the streams. The idea to use ERTS imagery in snowline determinations proved realistic and relatively easy to apply in practice. The method will be useful to estimate the glaciers' mass balance for large areas, provided some ground truth observations are made. Images from the end of the melt season are vital in this work, because it can be shown that a linear relationship exists between a glacier's mass balance and the height of the transient snowline at the end of the melt season. On an operational basis, satellite images obtained in the fall will provide valuable information on glaciers' mass balance, and thus also hydrologic data for various users, e.g. for water power engineers. To obtain full benefit from this new technique, it is necessary to have some background data of glaciological nature. (Sims-ISWS)
W76-08322

THE DEVELOPMENT OF A SNOW ROUTINE FOR THE HBV-2 MODEL,
Swedish Meteorological and Hydrological Inst., Stockholm.
S. Bergstrom.
Nordic Hydrology, Vol. 6, No. 2, p 73-92, 1975. 13 fig, 2 tab, 6 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, Snowmelt, Water, Parametric hydrology, Snow cover, Trees, Forests, On-site investigations, Forest watersheds, Snow, Precipitation(Atmospheric), Temperature, Runoff.
Identifiers: *Snow routine, *Sweden, Snow accumulation, Error function, Snow routing.

The development of a snow routine for the HBV-2 rainfall-runoff model was described. Experiences from field investigation that have contributed to the work were briefly discussed. In the snow routine, snow accumulation and snowmelt were simulated using daily totals of precipitation and mean daily temperatures. The application of the model to a 2178 sq km forested basin in central Sweden was shown. A critical study of the interaction and effects of the parameters was carried out. (Roberts-ISWS)
W76-08338

BEHAVIOUR OF OIL UNDER CANADIAN CLIMATIC CONDITIONS. PART 1. OIL ON WATER UNDER ICE-FORMING CONDITIONS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5B.
W76-08365

THE STATE OF WATER IN PLANT TISSUES AT NEGATIVE TEMPERATURES UNDER NATURAL CONDITIONS, (IN RUSSIAN),
Kirov Agric. Inst., Kirov, USSR.
For primary bibliographic entry see Field 2I.
W76-08368

SNOW-REGULATING ROLE OF THE FOREST BELTS IN THE STEPPES OF THE KRASNOYARSK KRAI, (IN RUSSIAN),
T. I. Alifanova.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk. 1, p 42-47, 1975. (Engl. Summ.).

Descriptors: *Snowpacks, *Grasslands, Regulation, Forests.
Identifiers: *Forest belts, Steppes, *USSR(Krasnoyarski Krai).

The total range of the forest belt (including Scotch pine and black poplar) influence on the snow distribution is as much as 30 H (multiples of tree height) in this region (Russian SFSR, USSR), it widens to 50 H and more with agricultural techniques in areas with weakened protection. Snow keeping in the open field on the surface of plowland is 25%, in the fields which are protected by belts of blown construction it is 65%, in the fields of transulate construction, 81% and in the fields of dense construction, 55%: with the agricultural techniques applied it is 94%, 108% and 93%, respectively. Water supply in the protected fields, surpassing water supply in the open fields is: at the belts of blown construction 215 m3, with stubble 325 m3; with transulate construction 255 m3 and 450 m3, respectively; with dense construction it is 80 m3 and 235 m3/ha of sown field, respectively.--Copyright 1976, Biological Abstracts, Inc.
W76-08383

EFFECT OF CRUDE OIL ON POPULATIONS OF BACTERIA AND ALGAE IN ARTIFICIAL PONDS SUBJECT TO WINTER WEATHER AND ICE FORMATION,
For primary bibliographic entry see Field 5C.
W76-08453

ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. M. Anderson, H. L. McKim, L. W. Gatto, R. K. Haugen, and W. K. Crowder.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-21767, $6.00 in paper copy, $2.25 in microfiche. Final Report, February 26, 1974. 112 p, 56 fig, 7 tab, 59 ref. NASA S-70253-AG.

Descriptors: *Remote sensing, *Cold regions, *Snow cover, *Estuaries, *Alaska, *Arctic, Subarctic, Satellites(Artificial), Permafrost, Rivers, Ice, Bays, Water circulation, Deposition(Sediments), Data processing, Instrumentation.
Identifiers: *ERTS, *Cook Inlet(Alaska).

ERTS-1 imagery provides a means of distinguishing and monitoring estuarine surface water circulation patterns and changes in the relative sediment load of discharging rivers on a regional basis. Physiognomic landscape features were used as geologic and vegetative indicators in preparation of a surficial geology, vegetation, and permafrost map at a scale of 1:1 million using ERTS-1 band 5 imagery. The detail available from ERTS-1 imagery at 1:1 million scale compared favorably with the detail available on U.S. Geological Survey Miscellaneous Geologic Investigation Maps at a scale of 1:250,000. Physical boundaries mapped from ERTS-1 imagery in combination with ground truth obtained from existing small scale maps and other sources resulted in improved and more detailed maps of permafrost terrain and vegetation for the same area. Comparison of ERTS-1 and Mariner imagery has revealed that the thermokarst depressions found on the Alaskan North Slope, polygonal patterns on the Yukon River Delta, and the alas topography in the Yakutian region of Siberia are possible analogs to some Martian terrain features. Snowpack cover within a research watershed has been analyzed and compared to ground data. Large river icings along the proposed Alaska pipeline route from Prudhoe Bay to the Brooks Range have been monitored. Sea ice deformation and drift northeast of Point Barrow, Alaska have been measured during a four day period in March and shore-fast ice accumulation and ablation along the west coast of Alaska have been mapped for the spring and early summer seasons. (Sims-ISWS)
W76-08510

OCEANOGRAPHIC CONDITIONS DURING 1973 IN RUSSEL FJORD, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W76-08525

THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-08537

THE NITROGEN BALANCE OF ARCTIC TUNDRA: PATHWAYS, RATES, AND ENVIRONMENTAL IMPLICATIONS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W76-08678

2D. Evaporation and Transpiration

ON-SITE RUNOFF DEPLETION AT THREE IMPOUNDMENTS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 4A.
W76-08122

A MODEL FOR ESTIMATING ACTUAL EVAPOTRANSPIRATION FROM POTENTIAL EVAPOTRANSPIRATION,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark).
K. J. Kristensen, and S. E. Jensen.
Nordic Hydrology, Vol. 6, No. 3, p 170-188, 1975. 10 fig, 2 tab, 15 ref.

Descriptors: *Evapotranspiration, *Model studies, *Vegetation, Barley, Grasses, Sugar beets, Soil water, Climatology, Runoff, Root zone, Water supply, Rainfall, Evaporimeters, Measurement, Estimating.
Identifiers: *Actual evapotranspiration, *Potential evapotranspiration, *Vegetation density, Fodder, Soil water content, Climatic demand.

A model for calculating the daily actual evapotranspiration based on the potential one was presented. The potential evapotranspiration was reduced according to vegetation density, water content in the root zone, and the rainfall distribution. The model was tested by comparing measured (EAm) and calculated (EAc) evapotranspirations from barley, fodder sugar beets, and grass over a four-year period. The measured and calculated values agreed within 10%. The model also yielded information on soil water content and runoff from the root zone. In the model it was assumed that runoff did not occur before the soil was resaturated to field capacity after drying out. If this requirement was not fulfilled (due to steep slopes, impermeable soils, some cracking soils), the model failed to work. For most soils, the model could be used, and yielded information on the day-by day actual evaporation, change in soil water content, and runoff. (Roberts-ISWS)
W76-08132

WATER USE BY SALTCEDAR AS MEASURED BY THE WATER BUDGET METHOD,
Geological Survey, Lubbock, Tex.
T. E. A. van Hylckama.
Available from Supt. of Documents, GPO, Wash. D. C. 20402, price $1.30. Professional Paper 491-E, 1974. 30 p, 35 fig, 17 tab, 34 ref.

Descriptors: *Evapotranspiration, *Hydrologic budget, Vegetation, Analytical techniques, *Water loss, Climatology, Environmental effects, Hydrologic cycle, Riparian plants, Salinity, Soil moisture, *Water utilization, *Arizona.
Identifiers: *Saltcedar water use, *Water budget method.

Water use by saltcedar (Tamarix pentandra) was studied from 1961 through 1967 near Buckeye, Ariz. The test site, in the flood plain of the Gila River, was surrounded by a kilometre-wide dense strip of saltcedar thickets. Areas to the north and south of the strip were mainly desert and a few cotton fields. The test site growing season lasts 8 to 9 months, the humidity is low, winds are strong, summer temperatures at the site often reach 50 deg C, and evapotranspiration rates are among the highest in the United States. Evapotranspiration rates and quantities were observed in six plastic-lined evapotranspirometers (tanks) with 81 square-metre surfaces. Analyses were made on the effects of depth to groundwater in the tanks, of salinity of soil moisture, and of vegetation density. Rates of water use from bare and vegetated soil were observed in five smaller tanks. When the depth to groundwater, or water table, was 1.5 m (metres) the average water use was about 215 cm/yr (centimetres per year); when the water table was 2.1 m, the use diminished to about 150 cm/yr; and when the water table was 2.7 m, the yearly water use was less than 100 cm/yr. Water use varies greatly with salinity of the soil moisture. (Woodard-USGS)
W76-08573

RELATION BETWEEN PLANT TRANSPIRATION AND METABOLISM, (IN RUSSIAN),
Tashkent Agricultural Academy (USSR).
I. I. Razmaev.
Uzb Biol Zh. 19(1), p 18-21, 1975.

Descriptors: *Plant tissues, Corn(Field), *Transpiration, *Metabolism, *Water uptake, *Equations, Mathematical studies.
Identifiers: *Cell sap activity.

Fractionation of water in the cells of plant (corn) tissues into free, osmotically and colloidally bound was insufficient for characterizing the water regime. It was necessary to introduce another parameter of the cell sap activity, namely, Wk, the kinetic energy directly affecting proteins and complex compounds or proteins with other substances and under the effect of which the submolecular organization of the protoplast changes. An equation for calculating Wk is proposed. The possibility of using transpiration as an integral index characterizing the state of a plant was substantiated.--Copyright 1976, Biological Abstracts, Inc.
W76-08583

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
E. T. Kanemasu.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 740, $6.75 in paper copy, $2.25 in microfiche. Kansas Water Resources Research Inst. Dec. 1975. Projected Conducted in cooperation with Agri. Met. Sec., Dept. of Agri. Eng. Univ. of Nebr., Lincoln, Nebraska. OWRT B-038-KAN(1). 14-31-0001-4147.

Descriptors: *Lysimeters, *Evapotranspiration, *Great Plains, Remote sensing, Model studies, Water balance, Estimating measurement, Heat resistance, Boundary layers, Instrumentation.
Identifiers: *Canopy temperature, *Thermal scanner, *Boundary layer resistance, Atmospheric attenuation.

Because evapotranspiration is usually a major component in the water balance, a method for estimating evapotranspiration of a large region is of major importance. Resistance forms of the energy balance equation require the measurement of a boundary layer resistance to heat or mass transport,corp and air temperature, net radiation,vapor pressure, and soil heat flux. The exact form of the equation may differ depending on the availability of input data and the specific assumptions used by the investigators. Four separate equations/techniques were tested against lysimetric and/or Bowen ratio-energy balance estimates of evapotranspiration to develop empirical equations under varying conditions. Resistance forms of the energy balance, in which data could be supplied, in part, by remote sensing, were also evaluated. Thermal scanner measurements were evaluated for estimating canopy temperature. Accurate extrapolation of scanner data to ground level is essential for estimating evapotranspiration. Atmospheric attenuation can produce errors in absolute temperatures of 2 to 6 C. (See W76-08586 thru W76-08591).
W76-08585

RESISTANCE-ENERGY BALANCE METHOD FOR PREDICTING EVAPOTRANSPIRATION: DETERMINATION OF BOUNDARY LAYER RESISTANCE AND EVALUATION OF ERROR EFFECTS,
S. B. Verma, N. J. Rosenberg, B. L. Blad, and M. W. Baradas.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. I-1 thru I-29.

Descriptors: *Evapotranspiration, *Model studies, Measurement, *Sorghum, *Millet, *Advection, Lysimeters, Energy balance,

Micrometeorology, Microclimates, Heat transfer, Latent heat, Crop response.
Identifiers: *Error analysis, Turbulent transfer, Sensible heat transfer, Latent heat transfer, *Boundary layer resistance.

A resistance model of evapotranspiration (ET) requiring measurement of boundary layer resistance, crop and air temperature, net radiation and soil heat flux was tested over sorghum and millet grown at Mead and Mitchell, Nebraska. Boundary layer resistance was estimated from friction velocity measurements used in a stability-corrected aerodynamic method. Friction velocity was computed by means of the Deacon-Swinbank approach. Evapotranspiration rates estimated by the resistance model compared well with results of lysimetric and energy balance measurements, on both a short-period and a daily basis. An error analysis was made to evaluate the relative influence of errors in measurement of the constituent input parameters. This analysis, in conjunction with field measurement, indicates that the resistance model evapotranspiration estimates are quite sensitive to errors in crop temperature measurement, especially in non-advective conditions, but are less strongly affected by errors in the estimation of boundary layer resistance. Boundary layer resistance for the sorghum and millet crops at varying stages of growth are presented as functions of windspeed. (See also W76-08585.)
W76-08586

AN EVALUATION OF A RESISTANCE FORM OF THE ENERGY BALANCE TO ESTIMATE EVAPOTRANSPIRATION,
J. L. Heilman, and E. T. Kanemasu.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. II-1 thru II-22.

Descriptors: *Evapotranspiration, *Model studies, Boundary layers, Heat resistance, Latent heat, Heat transfer, Lysimeters, Sorghum, Soybeans, Crop response.
Identifiers: *Boundary layer resistance, Diffusion resistance, Momentum transport, Heat transport, Canopy temperature.

An evapotranspiration model that uses the diffusion resistance to heat transport (rH) in the turbulent boundary layer was evaluated for soybean (Glycine max (L.) cv. Williams) and sorghum (Sorghum bicolor (L.) cv. Pioneer 846). Model estimates of latent heat flux (LE) were within 4% and 15% of lysimetric measurements for soybean and sorghum, respectively. When using resistance to momentum (rD), estimates of LE for soybean were 25% greater, but for sorghum only 10% greater than when using resistance to heat transport (rH). (See also W76-08585)
W76-08587

RESISTANCE-MASS TRANSFER METHOD FOR ESTIMATING EVAPOTRANSPIRATION: COMPARISON WITH LYSIMETRIC MEASUREMENTS IN IRRIGATED SORGHUM,
M. W. Baradas, N. J. Rosenberg, B. L. Blad, and S. B. Verma.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p III-1 thru III-23.

Descriptors: *Evapotranspiration, *Sorghum, Moisture content, *Soil moisture, *Model studies, Crop response, Advection, Microclimates, Micrometeorology, Stomata, Canopy, Cover crops.
Identifiers: Stomatal resistance, Canopy resistance.

A resistance-mass transfer model of evapotranspiration (LE) was compared with lysimetric measurements in a field of irrigated sorghum (Sorghum bicolor Moench,CV. 'RS 633'). The model is an analogue of Ohm's law where the gradient of vapor pressure from leaf to air is the driving force (voltage) acting against the series resistances to diffusion exerted by the boundary layer and the plant canopy. Latent heat flux is the analog of current flow in Ohm's law. The crop canopy vapor pressure is assumed to be the saturation vapor pressure at the measured leaf temperature. For these tests boundary layer resistance values were provided by the method of Verma et.al. (1976). Canopy resistance, rc, was calculated from measured values of stomatal resistance and leaf area index. Alternatively, values were synthesized by solving the model with rc as the residual term (rc res) using lysimetric measurements of LE. These latter values were used to calculate the regression of canopy resistance on irradiance (rc reg). The model, when measured canopy resistances were used, provided estimates of LE to within 10% of the lysimetrically measured LE on a daily basis, although hourly values occasionally gave irregular agreement. With rc reg values, derived from one set of data and applied to an independent set, agreement between measured and modeled LE was also with + 10 % on a daily basis. Model estimates of LE using rc reg gave better agreement than those made with measured rc on an hourly basis. The model can be used effectively in sorghum when moisture supply is not limiting. An experimental effort is required to develop rc values as joint functions of irradiance and soil moisture potential in order to expand the model's usefulness to rainfed conditions or to any situations where soil moisture conditions restrict the rate of evapotranspiration. (See also W76-08585)
W76-08588

COMPARISON OF A MODIFIED BROWN-ROSENBERG RESISTANCE MODEL WITH OTHER EVAPOTRANSPIRATION ESTIMATION METHODS: TESTS IN AN IRRIGATED SORGHUM FIELD,
S. B. Verma, and N. J. Rosenberg.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. IV-1 thru IV-19.

Descriptors: *Evapotranspiration, *Model studies, Estimating, *Sorghum, Irrigation, Crop response, *Radiation, Air temperature, Nebraska.
Identifiers: Net radiation, Air vapor pressure, Canopy resistance, Stomatal resistance, Penman method, Potential evapotranspiration, Resistance models.

The Brown-Rosenberg (1973) resistance model for estimating evapotranspiration was modified and tested in an irrigated sorghum field at Mead, Nebraska. The model requires inputs of net radiation, air temperature and vapor pressure, canopy and boundary layer resistance. The first three of these parameters were measured. The canopy resistance was estimated from a functional dependency on irradiance. The boundary layer resistance was estimated from a functional dependence on windspeed. The model prediction agreed with direct lysimetric and Bowen ratio-energy balance measurements of latent heat flux to within 10% on both an hourly and daily basis. The Brown-Rosenberg model is useful when neither direct nor remotely sensed canopy temperature data are available and when the separate impacts of the environmental and crop parameters mentioned above on the evapotranspiration process are to be evaluated. (See also W76-08585)
W76-08589

CANOPY TEMPERATURE MEASUREMENT OF SORGHUM AND MILLET WITH LEAF THERMOCOUPLE AND INFRARED THERMOMETER TECHNIQUES,
B. L. Blad, N. J. Rosenberg, E. T. Kanemasu, and J. L. Heilman.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. V-1 thru V-34.

Descriptors: *Evapotranspiration, Remote sensing, *Radiation, *Thermal radiation, Sorghum, Nebraska, Kansas, *Infrared radiation.
Identifiers: *Crop temperature, Radiation thermometer, Thermal radiometer, Millet.

Crop temperature of sorghum at Mead, Nebraska and Manhattan, Kansas and of millet at Scottsbluff, Nebraska was measured by IR thermometry and with attached leaf thermocouples. In both crops agreement between the temperature measured by the IR thermometer (TIR) and that measured by the thermocouple (TTC) was better for millet than for sorghum. Improvement in the agreement was noted as crop cover increased. Except at Manhattan, TIR and TTC agreed sufficiently well, with a few exceptions, during the daytime to provide reliable estimates of evapotranspiration (ET) using crop temperature based ET models. At night, in most cases, TTC was nearer the crop temperature expected from air temperature gradient measurements. The evidence in favor of more accurate estimation of crop temperature by TTC was not totally convincing, however. Results of this study point out a need to study several crop, soil and instrument factors which may affect the accuracy of the crop temperature measurements. (See also W76-08585)
W76-08590

THERMAL SCANNER MEASUREMENTS OF CROP TEMPERATURES TO ESTIMATE EVAPOTRANSPIRATION,
J. L. Heilman, E. T. Kanemasu, N. J. Rosenberg, and B. L. Blad.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. VI-1 thru VI-17.

Descriptors: *Evapotranspiration, *Soybeans, *Sorghum, Temperature, Measurement, Remote sensing, :Infrared radiation, Crop response.
Identifiers: Emissivity, Infrared thermometry, Aerosols, Precipitable water, Atmospheric attenuation, Boundary-layer resistance, *Millet, *Crop temperature.

Temperatures of soybean (Glycine max L.), sorghum (Sorghum bicolor L.), and millet (Panicum miliaceum L.), measured with a thermal scanner flown at altitudes of 610 and 1220 m, were used in a resistance form of the energy-balance equation to estimate evapotranspiration (ET). Atmospheric attenuation produced errors of 2 to 6 C in the scanner measurements. Errors from neglecting emissivity corrections were less than 0.5 C. A correction procedure relating temperature error to atmospheric precipitable water was applied to the scanner measurements. Estimates of ET using the corrected temperatures differed from lysimetric measurements by -0.40 to 0.17 ly/min. It was found that accurately extrapolating scanner measurements to ground level was essential for estimating ET. (See also W76-08585).
W76-08591

2E. Streamflow and Runoff

SNOWMELT-RUNOFF MODEL FOR STREAM FLOW FORECASTS,
Eidgenoessische Institut fuer Schneeund Lawinenforschung, Davos (Switzerland).
J. Martinec.
Nordic Hydrology, Vol. 6, No. 3, p 145-154, 1975. 5 fig, 1 tab, 6 ref.

Descriptors: *Snowmelt, *Runoff, *Streamflow, *Model studies, *Forecasting, Meteorology, Rainfall-runoff relationships, Snow, HYdology, Melt water, Ablation, Temperature.
Identifiers: *Runoff model, *Degree-day factor, Snow accumulation, Discharge computations, Snowmelt-runoff computation.

A snowmelt-runoff model, based on the development of rainfall-runoff models, was described. It was based on taking into account the variability of the degree-day factor, recession coefficient, and snow coverage. It can be adapted to heterogenous conditions of snow accumulation and temperature in mountainous basins. Meltwater depth was calculated by using the number of degree-days obtained as the average of positive temperatures observed over a 24 hour period. Due to varying conditions in the snowpack and the fact that the air is not the only source of heat, the degree-day factor varied over a wide range. The snow density appeared to be a useful index for estimation degree-day ratios in the absence of direct measurements. The accuracy of short-term forecasts depended on the knowledge of the future trend of temperature. Seasonal forecasts of the runoff pattern in a snowmelt season could be carried out if the expected temperature conditions were given. (Roberts-ISWS)
W76-08131

ULTRASONIC RIVER FLOW MEASUREMENT,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 7B.
W76-08241

WATER TEMPERATURE VARIATIONS WITHIN A MAJOR RIVER SYSTEM,
University of Strathclyde, Glasgow (Scotland). Dept. of Geography.
K. Smith.
Nordic Hydrology, Vol. 6, No. 3, p 155-169, 1975. 6 fig, 8 tab, 15 ref.

Descriptors: *Water temperature, *Streamflow, *River systems, Air temperature, Snowmelt, Electric power, Ecology, Time, Rivers, On-site data collections, Discharge(Water), Hydrology, Storms.
Identifiers: *Tees River(England), *England, *Temperature variations, River temperature, Storm rainfall, Multiple regression.

The relationships between river water temperature, air temperature, and streamflow were measured continuously for one year at four sites along the main stream of the river Tees in northern England. River temperatures correlated closely with equivalent air temperatures at each site, but emphasis was placed on the effects of hydrological factors on water temperature variations within the 818 sq km basin. The range of water temperature fluctuations was shown to increase upstream, and the highest river maxima were also recorded in the upper reaches of the river, owing to the relatively low volume of discharge. On a shorter time scale, streamflow was also found to exert an important influence on river temperature during snowmelt and peak flow events arising from storm rainfall. A multiple regression analysis indicated that air temperature and streamflow together accounted for up to 85% of the variation of daily maximum and minimum river temperatures in summer. (Roberts-ISWS)
W76-08340

DIMENSIONLESS SOLUTION OF DAM-BREAK FLOOD WAVES,
Patras Univ. (Greece). School of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-08343

SIMULATION OF HYDRAULIC PROCESSES IN OPEN CHANNELS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-08344

APPLICATION OF THE NATIONAL WEATHER SERVICE FLASH-FLOOD PROGRAM IN THE WESTERN REGION,
National Weather Service Salt Lake City, Utah. Western Region.
For primary bibliographic entry see Field 4A.
W76-08415

CHANNEL FLOW OVER PERMEABLE BEDS OF GRADED SPHERES,
Humphreys (Howard) and Sons, Reading (England).
For primary bibliographic entry see Field 8B.
W76-08511

EFFECTS OF HYDROLOGIC REGIME ON MAGNITUDE AND FREQUENCY OF DOMINANT DISCHARGE,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
G. Pickup, and R. F. Warner.
Journal of Hydrology, Vol. 29, No. 1/2, p 51-75, March 1976. 8 fig, 2 tab, 42 ref.

Descriptors: *Discharge(Water), *Hydrologic aspects, *Australia, Frequency curves, Bank storage, Bed load, Annual flood, Geomorphology, Hydrology, Annual peak discharge, Flow, Sediment transport.
Identifiers: *Hydrologic regime, *Dominant discharge, *Cumberland basin(Australia),Bed-load transport, Annual series, Fluvial geomorphology.

Estimates of three flows categorized as dominant discharge were derived for Cumberland Basin streams: the most effective discharge with regard to bed-load transport, the 1.58-year flood, and the natural bankfull discharge. The most effective discharge was found to have a return period of 1.15-1.40 years on the annual series but was much smaller than the 1.58 year flood. Bankfull discharge return periods were mainly within the range 4-10 years on the annual series. Observations of channel changes in Crawfords Creek indicated that the characteristics of the bed are related to flows similar to the most effective discharge but these flows do not erode the banks. Instead, bank erosion is related to much larger floods. It was suggested that many Cumberland Basin streams are not incised but that their capacity is determined by large floods. Two groups of flows, it was concluded, determine channel characteristics: the small flows which transport moot of the bed load and the large flows which determine channel capacity. Streamflow is dominated by two populations of runoff events, while channel bed material contains little fine to medium sand. Together, these two factors modify the typical process balance involved in channel and floodplain formation. (Roberts-ISWS)
W76-08514

A RECONSIDERATION OF THE FIERING TWO-STATION MODEL,
Birmingham Univ. (England). Dept. of Mathematical Statistics.
For primary bibliographic entry see Field 4A.
W76-08519

NONPARAMETRIC STATISTICAL ANALYSIS OF ANNUAL PEAK FLOW DATA FROM A RECENTLY URBANIZED WATERSHED,
Mount Rogers Planning District Commission, Marion, Va.
For primary bibliographic entry see Field 4C.
W76-08522

INTERSTATION CORRELATION OF PEAK-FLOW ESTIMATES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-08555

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 2: NORTHERN GREAT BASIN AND CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-08556

HYDROLOGY OF THE THREE SINKHOLE BASINS IN SOUTHWESTERN SEMINOLE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-08572

PRELIMINARY HYDROLOGIC DESIGN OF SMALL FLOOD DETENTION RESERVOIRS,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 8B.
W76-08731

RAINFALL AND FLOODS IN INDIA DURING 1974 SOUTHWEST MONSOON PERIOD,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2B.
W76-08732

COMPLEX WIDTH-DISCHARGE RELATIONS IN NATURAL RIVER SECTIONS,
Lanchester Polytechnic, Coventry (England).
K. S. Richards.
Geological Society of America Bulletin, Vol. 87, No. 2, p 199-206, February 1976. 5 fig, 2 tab, 27 ref.

Descriptors: *Rivers, *Hydraulic properties, *River flow, Channels, Channel flow, Width, Discharge(Water), Flow, Geomorphology, Analytical techniques, Hydraulics.
Identifiers: *Width-discharge relations, Hydraulic geometry.

Hydraulic geometry exponents may be used to discriminate between types of river section. This was illustrated by a discriminant analysis of data from riffle and pool sections. The complexity of most natural channels, however, precludes the use of a single index to cover a wide range of discharges. This was demonstrated in an analysis of several width-discharge curves defined up to, but not beyond, bankfull stage. (Sims-ISWS)
W76-08735

COMPUTATION OF TIDAL FLOW IN WELL-MIXED ESTUARIES,
Washington Univ., Seattle. Dept. of Aeronautics; and Washington Univ., Seattle. Dept. of Mathematics.
For primary bibliographic entry see Field 2L.
W76-08741

SUPPRESSION OF WAVES IN SLOTTED-WALLED CHANNEL,
Trinity Coll., Cambridge (England).
For primary bibliographic entry see Field 8B.
W76-08742

DISSIPATION OF TURBULENT ENERGY IN A NATURAL CHANNEL,
Gidrometeorologicheskii Institut, Odessa (USSR).
For primary bibliographic entry see Field 8B.
W76-08744

2F. Groundwater

GROUND WATER FLOW NO LONGER A MYSTERY,
National Water Well Association, Columbus, Ohio.
J. H. Lehr, and W. A. Pettyjohn.

Journal of Environmental Health, Vol. 38, No. 4, p. 242-250. Jan/Feb 1976.

Descriptors: *Ground water flow, *Groundwater recharge, *Groundwater potential, *Water table, *Wells, *Water pollution sources, *Model studies, Aquifer, Surface-groundwater relationship, Path of pollutants.

Ground water occurs in rock formation that have interconnections for the water to pass through. Water usually moves only a few feet per year, though locally it may flow rapidly. Ground water is a very significant source of supply and is generally of high quality but there is a close relatioship between surface and ground water, so that management of one must include the other. Pollution from the land and from streams finds its way into ground water where it may remain for many years before entering wells in the area or contaminating other surface water supplies. Experiments are explained which demonstrate some principle ground water flow. A model with a porous consolidated mixture of sand and epoxy resin between plexiglass simulates a rock formation; ink is introduced to show flow. One demonstration shows how a pump changes flow wihin the aquifer. As soon as the pump is turned on, each particle of water is realigned toward the pump and eventually a new equilibrium is established which depends on the new set of boundary conditions which affect the flow. Another demonstration shows how a pump draws down the water table and creates a cone of depression. To obtain optimum benefits from an aquifer the system must be jointly controlled and operated. A third model shows the effect of a stream on the hydrologic gradient of the aquifer. In effect the stream acts as an open horizontal well which has a lower head and therefore draws groundwater toward it, even water lower than it. Placement of septic tanks, wells, waste disposal sites, etc., all affect quality of water. Proper management and strict enforcing of guidelines is necessary to alleviate problems in these areas. (Smith-North Carolina)
W76-08114

AN INTEGRATED FINITE DIFFERENCE METHOD FOR ANALYZING FLUID FLOW IN POROUS MEDIA,
California Univ., Berkeley. Dept. of Civil Engineering.
T. N. Narasimhan, and P. A. Witherspoon.
Water Resources Research, Vol. 12, No. 1, p 57-64, February 1976. 10 fig, 30 ref.

Descriptors: *Numerical analysis, *Groundwater movement, *Porous media, Heat transfer, Conduction, *Finite element analysis, Flow, Equations, Potential flow, Theis equation, Fracture permeability, Mathematical studies, Computers, Stability.
Identifiers: *Integrated finite difference method, *Finite difference gradients, Explicit-implicit iterative scheme, Galerkin method, Integral formulations, Discretization, Point source flow.

The theoretical basis for the integrated finite difference method (IFDM) was presented to describe a powerful numerical technique for solving problems of groundwater flow in porous media. The method combines the advantages of an integral formulation with the simplicity of finite difference gradients and is very convenient for handling multidimensional heterogeneous systems composed of isotropic materials. Three illustrative problems were solved to demonstrate that two- and three-dimensional problems are handled with equal ease. Comparison of IFDM with the well-known finite element method (FEM) indicated that both are conceptually similar and differ mainly in the procedure adopted for measuring spatial gradients. The IFDM includes a simple criterion for local stability and an efficient explicit-implicit iterative scheme for marching in the time domain. If such a scheme can be incorporated in a new version of FEM, it should be possible to develop an improved numerical technique that combines the inherent advantages of both methods. (Visocky - ISWS)
W76-08123

DETERMINING AQUIFER TRANSMISSIVITY BY MEANS OF WELL RESPONSE TESTS: THE UNDERDAMPED CASE,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
G. van der Kamp.
Water Resources Research, Vol. 12, No. 1, p 71-77, February 1976. 2 fig, 3 tab, 7 ref.

Descriptors: *Aquifer testing, *Transmissivity, *Theoretical analysis, Aquifer characteristics, Water levels, Well filters, Equilibrium, Equations, Water level fluctuations, Well casings, Aquifers, Artesian aquifers, Artesian heads, On-site data collections.
Identifiers: *Well response test, *Slug test, *Oscillations, *Damping, Overdamping, Underdamping, Inertial effects, Effect length, Effective radius.

Well response tests, often referred to as slug tests, provide a relatively simple and inexpensive method for estimating aquifer transmissivity. An approximate theory was developed for the problem of underdamped well response where the inertia of the water in the well column results in force-free oscillation of the water level in the well. This type of response is often encountered in conjunction with highly permeable aquifers. The theory is applicable for nearly all such cases except those where the oscillation is very quickly damped out. Theoretical predictions compared well with empirical results and indicated that the theory may be used to obtain estimates of aquifer transmissivity. This theory for the underdamped case together with existing theory for overdamped response makes it possible to obtain an estimate of transmissivity from well response tests for almost any aquifer. (Visocky - ISWS)
W76-08124

ESTIMATION BY DIGITAL COMPUTER OF THE DRAWDOWN CAUSED BY GROUNDWATER WITHDRAWAL,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4B.
W76-08140

METHOD FOR LOCATING AND EVALUATING GEOTHERMAL SOURCES OF ENERGY BY SENSING ELECTROSTATIC VOLTAGE GRADIENTS,
For primary bibliographic entry see Field 4B.
W76-08204

TRANSIENT FREE SURFACE FLOW TO A WELL: AN ANALYSIS OF THEORETICAL SOLUTIONS,
Centro di Ricerca IBM di Venezia (Italy).
G. Gambolati.
Water Resources Research, Vol. 12, No. 1, p 27-39, February 1976. 12 fig, 1 tab, 59 ref.

Descriptors: *Unsteady flow, *Water table aquifers, *Equations, Storage coefficient, Specific yield, Water wells, Drawdown, Groundwater, Stress, Pressure head, Theis equation, Dupuit-Forchheimer theory.
Identifiers: *Delayed yield, *Linearization, *Delay index, Elastic storage, Vertical flow, Radial flow, Well storage.

Results based on linearization and on the delayed yield concept provide the most theoretical advancements to date for solving the differential equations of transient free surface flow to a fully penetrating gravity well. If the elastic storage coefficient is markedly less than the specific yield, vertical flow is predominant in a cylindrical zone of the water table between two regions where flow is essentially radial and controlled by two different Theis equations. The true physical alpha (reciprocal of Boulton's delay index) is found to vary almost linearly with the reciprocal of the distance from the pumped well and becomes a constant at some distance (equal to twice the aquifer thickness if the medium is isotropic). An empirical delay index is also found by equating Boulton's solution and the linearized average drawdown. Its expression enables the use of the delayed yield solution in computing average drawdowns with an accuracy equal to that of the linearization approach. the present solutions assumed small water table drawdowns and an infinite aquifer. (Visocky-ISWS)
W76-08333

FLOW INTERFERENCE EFFECTS AT FRACTURE INTERSECTIONS,
Leeds, Hill, and Jewett, Inc., San Francisco, Calif.
C. R. Wilson, and P. A. Witherspoon.
Water Resources Research, Vol. 12, No. 1, p 102-104, February 1976. 4 fig, 1 ref.

Descriptors: *Groundwater movement, *Fracture permeability, *Model studies, Hydraulic models, Flow, Laminar flow, Fractures(Geologic), Cracks, Rocks, Hydrology, Hydraulics, Laboratory tests, Hydrogeology, Subsurface waters, Groundwater.
Identifiers: *Fracture intersections, Flow interference.

A series of laboratory experiments were conducted to determine the magnitude of laminar flow interference effects at fracture intersections. Circular conduits were used in these experiments to maintain strict dimensional tolerance, and the intersection head loss, if expressed in terms of equivalent length of straight conduit, should be the same order of magnitude for a circular pipe as for a parallel plate fracture model. The results indicated that interference effects at intersections are negligibly small in most fracture systems when flow is in the laminar regime. (Sims-ISWS)
W76-08335

SOLUTION FOR RADIAL-FLOW WITH NON-LINEAR ADSORPTION,
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 5B.
W76-08345

HYDROGEOLOGY OF THE SOUTH FORK OF LONG ISLAND, NEW YORK,
Wisconsin Univ. Oshkosh. Dept. of Geology.
C. W. Fetter, Jr.
Geological Society of America Bulletin, Vol. 87, No. 3, p 401-406, March 1976. 8 fig, 4 tab, 8 ref.

Descriptors: *Hydrogeology, *Groundwater, *Hydrologic budget, *Saline water-freshwater interfaces, *New York, *Atlantic coastal plain, Safe yield, Unconsolidated sediments, Saline water, Saline water intrusion, On-site investigations, Hydraulic conductivity, Transmissivity, Specific yield, Storage coefficient, Groundwater recharge, Artificial recharge, Septic tanks, Pumping, Observation wells, Water table, Aquifers.
Identifiers: *Long Island(NY), *Coastal aquifers, Raritan formation, Magothy formation.

The South Fork of Long Island, New York, is underlain by unconsolidated Pleistocene and Cretaceous sediments resting on crystalline bedrock. A two-layered aquifer system contains fresh groundwater with saline groundwater in the deeper strata. The average horizontal hydraulic conductivity of the upper aquifer is 49 m/day and of the lower aquifer is 25 m/day. The average annual precipitation of 1.14 m is the only natural

source of fresh water. After consumptive losses the precipitation provides about 1.85 x 10 to the 8th power cu m/yr to recharge the water table. Discharge of fresh groundwater occurs primarily as undersea outflow to the ocean at the perimeter of the area. The safe yield of the area is estimated to be 91,500 cu m/day. (Visocky-ISWS)
W76-08347

RADIAL DISPERSION THROUGH ADSORBING POROUS MEDIA,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W76-08512

TRANSIENT AQUIFER FLOWS BY CHARACTERISTICS METHOD,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
E. B. Wylie.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 12001, p 293-305, March 1976. 9 fig, 1 tab, 22 ref, 2 append. NSF GI-34771.

Descriptors: *Unsteady flow, *Numerical analysis, *Groundwater movement, *Aquifers, Computer models, Discharge(Water), Drawdown, Mathematical studies, Equations, Time, Wells, Computers, Theis equation, Transmissivity, Storage coefficient, Hydraulics, Groundwater.
Identifiers: *Method of characteristics, *Leaky aquifers, Radial flow, Computer time, Inertia multiplier, Transformation, Time step, Stability analysis.

A numerical model was presented to analyze nonsteady radial flow in a finite or infinite leaky aquifer system. An equation of motion alteration, which involves the introduction of an inertia multiplier, converted the standard equations of transient groundwater flow to a form suitable for efficient solution by the method of characteristics. The result was a numerical method that should be attractively competitive in computer time usage with other numerical procedures currently in use. The equations were presented and the procedure developed for axisymmetrical flow. Several examples were used to expose the influence of the size of the distance intervals and the size of the inertia multiplier on the accuracy of the numerical process. Either constant or time-variable discharge or drawdown rates may be used as boundary conditions in infinite or bounded radial aquifer systems. Radially varying aquifer properties and leakage may also be treated. (Visocky-ISWS)
W76-08513

THE GROUNDWATER OUTCROP-EROSION MODEL; EVOLUTION OF THE STREAM NETWORK IN THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Instituut voor Aardwetenschappen.
For primary bibliographic entry see Field 2A.
W76-08515

IMPROVED IMAGE-WELL TECHNIQUE FOR AQUIFER ANALYSIS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-08517

DYNAMIC RESPONSE OF AQUIFER SYSTEMS TO LOCALIZED RECHARGE,
Chile Univ., Santiago. Centro de Recursos Hidraulicos.
G. Cabrera, and M. A. Marino.
Water Resources Bulletin, Vol. 12, No. 1, p 49-63, February 1976. 7 fig, 18 ref.

Descriptors: *Recharge, *Streams, *Aquifers, *Finite element analysis, *Flow system, *Model studies, Analytical techniques, Base flow, Hydraulics, Numerical analysis, *Computer programs, Surface-groundwater relationships.
Identifiers: Boundary-value problems, Variational approach.

The response of stream-unconfined aquifer systems to localized recharge was investigated by means of a two-dimensional finite element model. A variational approach was used in conjunction with the finite element method to solve the ground-water flow equation. Linear approximated triangular elements were used to calculate the hydraulic head distribution in the flow region. The Crank-Nicholson centered scheme of numerical integration was employed to approximate the time derivative in the flow equation. A computer program was developed to calculate the hydraulic head distribution in the flow region. Solutions provided by the finite element model should prove useful in the evaluation of quantitative and qualitative changes in aquifer systems due to natural or artificial recharge. In addition, they should prove useful in the study of irrigation and drainage problems. (Singh-ISWS)
W76-08520

DESIGN OF GROUND-WATER LEVEL OBSERVATION NETWORK.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-08563

AMINO ACIDS AND GASES IN SOME SPRINGS AND AN OIL FIELD IN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-08568

ARTIFICIAL-RECHARGE EXPERIMENTS IN THE ALLUVIAL AQUIFER SOUTH OF FOUNTAIN, EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-08571

EXIT OF GROUND WATERS ON DRAINAGE BOUNDARIES,
Ebasco Services Inc., New York.
B. S. Browzin.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 102, No. GT2, Proceedings Paper 11909, p 159-173, February 1976. 4 fig, 6 tab, 15 ref, 5 append.

Descriptors: *Groundwater movement, *Flow, *Discharge(Water), Engineering structures, Hydraulic structures, Dams, Seepage, Reservoir leakage, Groundwater, Analytical techniques, Embankments, Earth dams, Slopes, Equations.
Identifiers: Exit point.

A known analytical solution provides the location of the exit point of the free surface of groundwaters as a function of the slope angle and the reduced discharge in a form of a finite integral. This integral was evaluated numerically and a substitute polynomial equation provided to determine the function. Based on the exact position of the exit point, a new discharge formula free from any preliminary assumptions was derived. It covers the range of slope angles from near 0 to 180 degrees for infinitely long aquifers. It was found that the same formula is applicable to certain finite lengths. Applicability of the function for the location of the exit point and the discharge formula for earth dams was considered. It was explained that a hydraulically equivalent rectangle, which substitute the upstream prism, must have the width of the base substantially smaller than that used in older theories. (Gibb-ISWS)
W76-08750

2G. Water In Soils

NUTRIENT AND SEDIMENT CHARACTERISTICS OF TILE EFFLUENT IN OHIO,
Ohio State Univ. Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08121

CALCULATING THE UNSATURATED HYDRAULIC CONDUCTIVITY AND DIFFUSIVITY,
Mississippi State Univ., State College. Dept. of Agronomy.
F. D. Whisler.
Soil Science Society of America Journal, Vol. 40, No. 1, p 150-151, January-February 1976. 2 fig, 7 ref.

Descriptors: *Unsaturated flow, *Hydraulic conductivity, *Diffusivity, *Moisture content, *Pressure head, Numerical analysis, Equations, Soil water movement, Soil water, Graphical analysis, Methodology, Soil properties.
Identifiers: Moisture characteristic curves.

The methods of R. D. Jackson and R. H. Brooks and A. T. Corey for calculating the unsaturated hydraulic conductivity from water content-pressure head relationships were compared. The corresponding diffusivity relationships can also be evaluated either by a numerical differentiation of the water content-pressure head curves plus the conductivity, or by direct calculation from the differentiation of the Brooks and Corey function. Both methods gave approximately the same results for the hydraulic conductivity relationships. The diffusivity values calculated from the Brooks and Corey functions were lower than those calculated by the numerical method for a Grenada silt loam soil. Both diffusivity relationships gave essentially the same beta values for the W. R. Gardner and M. S. Mayhugh diffusivity-water content function. (Visocky - ISWS)
W76-08142

DISTRIBUTION OF PLUTONIUM IN SOIL PARTICLE SIZE FRACTIONS OF LIQUID EFFLUENT-RECEIVING AREAS AT LOS ALAMOS,
Los Alamos Science Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W76-08160

OXYGEN RELATIONSHIPS IN A SOIL TREATED WITH SEWAGE EFFLUENT,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W76-08231

A COMPARATIVE STUDY OF THE EFFECT OF QUALITIES OF IRRIGATION WATER ON DIFFERENT SOILS,
Udaipur Univ. (India). Coll. of Agriculture.
For primary bibliographic entry see Field 3C.
W76-08301

THE EFFECT OF FOREST STANDS ON THE WATER CONTENT OF ROCKS OF THE LOESS COVER IN THE WESTERN REGIONS OF THE NORTHERN BLACK SEA AREA, (IN UKRANIAN),
USSR Akademiya Nauk URSR, Kiev. Instytut Geologichnykh Nauk.
For primary bibliographic entry see Field 4A.
W76-08303

SALT AND WATER BALANCE IN IMPERIAL VALLEY, CALIFORNIA,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 3C.

W76-08331

INFILTRATION ANALYSIS AND PERTURBATION METHODS 1. ABSORPTION WITH EXPONENTIAL DIFFUSIVITY,
City Coll., New York. Dept. of Mathematics.
D. K. Babu.
Water Resources Research, Vol. 12, No. 1, p 89-93, February 1976. 1 fig, 25 ref.

Descriptors: *Soil moisture, *Infiltration, *Model studies, Mathematical models, Equations, Analytical techniques, Subsurface waters, Diffusion, Soil temperature, Soil physical properties, *Absorption, Soils, *Diffusivity.

Simple perturbation methods were employed to analyze the horizontal absorption of moisture in unsaturated soils. The special case treated assumed the diffusivity to be an exponential function of the concentration and the concentration at the boundaries to be constant. The solution emerged as an explicitly determined power series in the Boltzmann variable. The resulting profiles were compared with some others found in the existing literature. A discussion about the relevance and advantages of this type of analysis formed the concluding part of the paper. (Sims-ISWS)
W76-08334

EFFECTS OF GRAZING ON INFILTRATION RATES IN WASTE WATER SPRAY FIELDS,
West Virginia Univ., Morgantown. Div. of Plant Sciences.
For primary bibliographic entry see Field 5E.
W76-08352

THERMAL PROPERTIES OF FINE TEXTURED MOLLISOLS UNDER VARYING MOISTURE CONDITIONS,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India).
R. P. Tripathi, and B. P. Ghildyal.
J Indian Soc Soil Sci. 22(2), p 103-108, 1974.

Descriptors: Soils, *Soil temperature, Soil water movement, *Moisture content, Specific heat, *Thermal properties, Thermal conductivity, Diffusivity, Physical properties, *Clay loam, *Loam, Clays.
Identifiers: *Mollisols, Phoolbagh clay loam, Beni silty clay loam, Haldi loam.

The specific heat of Phoolbagh clay loam, Beni silty clay loam and Haldi loam was 0.231, 0.224 and 0.207 Cal g -1 C-1, respectively, as determined by the radiation calorimeter. Thermal conductivity of the 3 soils ranged from 6.6x10-4 to 6.54 x 10-3 Cal cm-1 sec- -1 C-1 when the water content changed from 0.065-0.434 cm3 cm-3 respectively. In all the soils the thermal conductivity increased with percent saturation rapidly up to about 50% pore saturation. The rate of increase, however, decreased for pore saturation greater than 50%. The rate of increase in the thermal conductivity of Beni silty clay loam was higher than Haldi loam and Phoolbagh clay loam. Similarly, the rate of increase of thermal diffusivity (a) was higher in Beni silty clay loam than in Haldi loam and Phoolbagh clay loam. The maximum value of a occurred around 50% of pore saturation.--Copyright 1975, Biological Abstracts, Inc.
W76-08364

PORE SIZE DISTRIBUTION OF COMPACTED SOILS AFTER CRITICAL REGION DRYING,
Purdue Univ., Lafayette, Ind. Joint Highway Research Project.
R. N. Bhasin.
Report JHRP-75-3, March 1975. 220 p.

Descriptors: *Soil compaction, Soil water, Drying, Water vapor, *Porosity, Moisture content, Soil moisture, Analytical techniques.
Identifiers: *Pore size distribution(Soils), Mercury intrusion technique.

--Major objective was to develop an improved insight into the soil compaction process in terms of the pore size distribution resulting from variations of the soil compaction variables, and of the changes in this parameter arising as a result of exposing compacted soils to soaking under a moderate surcharge, thus partly simulating service conditions. The mercury intrusion technique was used to obtain pore size distributions on dried specimens of a number of naturally occurring soils, compacted at various water contents. The wet specimens were dried by transforming soil water to water vapor in the critical region without effecting change in the total porosity and probably in the size distribution of pores. It was shown that different soils compacted to a given percentage compaction, but to different total porosities. Soils compacted at Standard Proctor optimum moisture contents to different total porosities had pore size distributions similar to each other. (WES)
W76-08416

PROPERTIES OF EXPANSIVE CLAY SOILS; REPORT 2, A NUMERICAL PROCEDURE FOR PREDICTING HEAVE WITH TIME,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W76-08420

ARTIFICIALLY SIMULATING THE GEOLOGICAL HISTORY OF CLAY,
Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 8D.
W76-08421

INFILTRATION INTO INCREASINGLY PERMEABLE SOILS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR1, Proceedings Paper 11959, p 127-136, March 1976. 3 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Drainage, *Infiltration, *Infiltration rates, *Permeability, Soil properties, Soils, Digital computers, Irrigation, Hydraulic conductivity, Equations, Wetting, Depth.
Identifiers: *Infiltration capacity, *Green-Ampt equation, *Tabular procedures, Infiltration equation, Permeable soils.

A tabular procedure, based on the Green-Ampt equation, was developed to calculate infiltration into soil that becomes more permeable with depth. The procedure is simple and the results compared favorably with those obtained with a digital computer. The procedure supplements a previous paper which showed how the Green-Ampt equation could be used to calculate infiltration into soil becoming less permeable with depth. The Green-Ampt equation is emerging as a useful, simple, yet theoretically sound infiltration equation. The extension of the equation to soils where the permeability changes with depth should enhance its utility in practical applications, where soils are seldom, if ever, uniform. (Roberts-ISWS)
W76-08516

FUNDAMENTAL ASPECTS OF EROSION OF COHESIVE SOILS,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-08540

DEEP TILLAGE OF GRADED-FURROW-IRRIGATED PULLMAN CLAY LOAM,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-08543

RATE OF CHLORIDE AND WATER MOVEMENT IN SOUTHERN CALIFORNIA SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
R. J. Tullock, N. T. Coleman, and P. F. Pratt.
Journal of Environmental Quality, Vol. 4, No. 1, p 127-131, January-March 1975. 3 fig, 3 tab, 25 ref.

Descriptors: *Chlorides, *Soils, *Soil investigations, *Soil water movement, *California, Columns.
Identifiers: *Chloride movement, Anion movement.

Column experiments in the laboratory showed an increase of 2 to 25% in the relative rate of chloride movement in soils to water when the movement of water was calculated on a total pore-volume basis. The increase was explained as a result of anion exclusion next to the surfaces of negatively charged soil colloids. The relative rate of flow was decreased when the moisture retained by the air dry soils was deleted from the total pore solution. For soils containing sufficient clay to result in a cation exchange capacity greater than 10 meq/100g, an equation was developed relating the fraction of the pore solution in equilibrium with anions to the cation exchange capacity. Calculated transit times for anion movement from the soil surface to ground waters should include a correction for the volume of exclusion. (Gaylord Skogerboe-Colorado State)
W76-08545

NITRATE REDUCTION AND ASSOCIATED MICROBIAL POPULATIONS IN A PONDED HANFORD SANDY LOAM,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5G.
W76-08546

WATERSHED SOIL DETACHMENT AND TRANSPORTATION FACTORS,
Agricultural Research Service, Morris, Minn.
For primary bibliographic entry see Field 2J.
W76-08551

INTERACTION OF PLUTONIUM WITH COMPLEXING SUBSTANCES IN SOILS AND NATURAL WATERS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W76-08605

PROCEDURE FOR PLUTONIUM ANALYSIS OF LARGE (100 G) SOIL AND SEDIMENT SAMPLES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W76-08613

THE RESPONSES OF SOILS AND SOIL MICROORGANISMS TO SILVER IODIDE WEATHER MODIFICATION AGENTS,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
R. A. Sokol, and D. A. Klein.
Journal of Environmental Quality, Vol. 4, No. 2, p 211-214, April-June 1975. 4 fig, 18 ref.

Descriptors: *Soil chemistry, *Soil microorganisms, *Cloud seeding, *Organic matter, *Silver iodide, Microbial degradation, Soil environment.

To determine the consequences of AgI weather modification agent accumulation to the soil microbial environment, the effects of added silver compounds to microbial growth, anaerobic cellulose degradation, and the soil environment adjacent to a cloud seeding generator were investigated. Silver ion inhibited microbial growth in cultures at low concentrations and cultures saturated with AgI displayed an inhibition of growth initiation. An analysis of the soil surrounding a seeding generator site in Steamboat Springs, Colorado indicated that deposited silver tends to remain near the soil surface. Alterations in the soil environment due to high silver concentrations were indicated by consistently higher organic matter levels, water contents, microbial populations and rates of soil respiration. These results suggest that high concentrations of seeding agent potentially can alter the soil microbial environment by inhibiting organic matter decomposition, but that the silver levels which accumulate in seeded target areas should have no overt effects on the soil environment. (Skogerboe-Colorado State)
W76-08670

PHOSPHORUS MOVEMENT IN SOILS: SOIL-ORTHOPHOSPHATE REACTION KINETICS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-08672

THE IMPACT OF MOLYBDENUM-ENRICHED IRRIGATION WATER ON AGRICULTURAL SOILS NEAR BRIGHTON, COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-08675

COMPARISON OF TWO PREDICTIVE NONEQUILIBRIUM ONE-DIMENSIONAL MODELS FOR PHOSPHORUS SORPTION AND MOVEMENT THROUGH HOMOGENEOUS SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08677

THE NITROGEN BALANCE OF ARCTIC TUNDRA: PATHWAYS, RATES, AND ENVIRONMENTAL IMPLICATIONS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W76-08678

NITRATE, PHOSPHATE, AND POTASSIUM MOVEMENT INTO DRAINAGE LINES UNDER THREE SOIL MANAGEMENT SYSTEMS,
Florida Univ., Fort Pierce. Inst. of Food and Agricultural Science.
For primary bibliographic entry see Field 5B.
W76-08680

THE USE OF LIKELIHOOD FUNCTIONS TO FIT CONCEPTUAL MODELS WITH MORE THAN ONE DEPENDENT VARIABLE,
Institute of Hydrology, Wallingford (England).
J. R. Douglas, R. T. Clarke, and S. G. Newton.
Journal of Hydrology, Vol. 29, No. 1/2, p 181-198, March 1976. 3 fig, 5 tab, 10 ref.

Descriptors: *Model studies, *Streamflow, *Soil moisture, Precipitation(Atmospheric), Evaporation, Mathematical models, Rivers, Watersheds(Basins), Runoff, Groundwater, Mathematics, Statistics, Correlation analysis, Hydrology.
Identifiers: Variables, Model calibration.

Models of catchment behavior usually express one output, or dependent variable, as a function of several inputs, or independent variables; streamflow is commonly the dependent variable and precipitation and evaporation are independent variables. Soil moisture may also be measured, however, and this may be regarded as a second dependent variable that is also a function of precipitation and evaporation. Work is described which had as one objective a study of the usefulness of available soil moisture records for assisting with model calibration. Incorporation of soil moisture data in the model calibration procedure was achieved by generalizing the commonly-used least squares criterion to a likelihood function, a generalization made at the expense of introducing further assumptions regarding the probability distribution of model residuals. Streamflow, soil moisture, precipitation and evaporation sequences were used from two experimental catchments. The goodness of model fit was determined for each catchment with streamflow as single dependent variable and with streamflow and soil moisture as jointly dependent variables. Model efficiency, as measured by a goodness of fit criterion, was very little changed by inclusion of the soil moisture sequence, suggesting that this supplied but little information on model parameters. This result can be explained by the sparseness of the soil moisture record, relative to streamflow. (Sims - ISWS)
W76-08729

MEASUREMENT OF SOIL MOISTURE IN POONA BLACK COTTON SOIL USING AN INFRA-RED MOISTURE BALANCE,
Meteorological Office, Poona (India).
R. R. Kelkar, and V. R. Chivate.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 26, No. 4, p 525-530, October 1975. 4 fig, 1 tab, 6 ref.

Descriptors: *Soil moisture, *Soil moisture meters, *Measurement, Moisture content, Infrared radiation, Soil temperature, Rainfall, Precipitation(Atmospheric), Evaporation, On-site investigations, Soils, Soil physical properties, Agriculture.
Identifiers: *India.

Measurements of soil moisture were made at 0, 15, 30 and 45 cm depths in black cotton soil at Poona in June-October 1973, using an infra-red moisture balance. The results were presented and discussed in relation to rainfall and evaporation. Throughout the active monsoon period, the soil moisture in the 30-45 cm layer remained more or less constant (25% by weight). Due to evaporation and infiltration into lower levels there was generally less moisture at 15 cm depth than at 30 or 45 cm. The moisture content of the surface layer was most variable (8 to 32%) and highly sensitive to rainfall and evaporation. An inverse relationship has been observed between soil moisture and soil temperature at any depth. (Sims-ISWS)
W76-08734

2H. Lakes

ON THE OCCURRENCE OF PRESSURE WATER IN LOW BOGS, (IN GERMAN),
Volkseigener Betriebsfestigkeit Wasserversorgung und Abwasserbehandlung, Rostock (East Germany).
A. Kirchner.
Arch Acker Pflanzenbau Bodenkd. 19(9), p 613-617, 1975.

Descriptors: *Bogs, Pressure, *Water pressure, Surveys, Sites, Decomposing organic matter.
Identifiers: Water-logged zones.

Pressure water-logged zones of low bogs which result from groundwater tension and which, in extreme cases, may resemble spring-water bogs are often neglected on site surveying. The following distinguishing features are explained: relief convexity, occurrence of spring-water calc-tufas, intensive peat decomposition, increased ochering and the specific type of waterlogging. The geohydrological situation and aspects of hydrotechnical amelioration are discussed. In most cases, these water-logged zones should be excluded from the farmland area for economic reasons, since effective drainage of these zones cannot be accomplished at reasonable costs.--Copyright 1976, Biological Abstracts, Inc.
W76-08105

BIOLOGICAL PROBLEMS OF A MANMADE SMALL LAKE, (IN GERMAN),
Innsbruck Univ. (Austria). Hygienisches Institut.
For primary bibliographic entry see Field 5C.
W76-08107

WATER VOLUME TRANSPORT AND OSCILLATORY CURRENT FLOW THROUGH THE STRAITS OF MACKINAC,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
J. H. Saylor, and P. W. Sloss.
Journal of Physical Oceanography, Vol. 6, No. 2, p 229-237, March 1976. 10 fig, 2 tab, 7 ref.

Descriptors: *Straits, *Flow, *Great Lakes, *Lake Michigan, *Lake Huron, Currents(Water), Current meters, Discharge(Water), Discharge measurement, Flow measurement, Average flow, Flow profiles, Limnology.
Identifiers: *Oscillatory current flow.

Currents flowing through the Straits of Mackinac were recorded for a period of nearly 100 days during the summer and fall of 1973. Current meters were placed at four moorings on a north-south cross section at the Straits' narrowest constriction and arranged to measure vertical profiles of horizontal current velocity. The mean water volume transport from Lake Michigan to Lake Huron was measured at nearly 1900 cu m/s. Seasonal variations in the vertical structure of the mean current flows were related to density stratification of the water mass. Spectral analyses of the current records revealed many periodic features of the flow field which were superimposed on the mean discharge. The periodic components were identified and correlated with oscillations of water level in the Michigan and Huron lake basins. (Sims - ISWS)
W76-08128

STEADY STRATIFIED CIRCULATION IN A CAVITY,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
D-L. Young, J. A. Liggett, and R. H. Gallagher.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol. 102, No. EM1, Proceedings Paper 11903, p 1-17, February 1976. 11 fig, 1 tab, 16 ref, 3 append. NSF GK-23992.

Descriptors: *Circulation, *Finite element analysis, *Lakes, *Thermal stratification, *Temperature, Thermocline, Analytical techniques, Diffusivity, Hydraulics, Winds, Numerical analysis, Model studies.
Identifiers: *Eddy diffusivity, *Eddy viscosity, Nonlinear turbulent models.

An attempt was made, by introducing empirically defined, depth-dependent expressions for eddy diffusivity and eddy viscosity into the governing equations for two-dimensional behavior, to solve the problem of steady-state stratified flow in a lake subjected to surface shear. The set of four relevant partial differential equations (two momentum equations, mass conservation and the temperature diffusion equation) was transformed to a pair of nonlinear differential equations in the stream func-

tion and density. Integral conditions corresponding to the solution of these equations were established through the weighted residual concept, and finite element representations of the integrals were constructed. The resulting system of nonlinear algebraic equations was solved by means of quasilinearization technique. An extensive series of numerical solutions was presented to demonstrate that the results obtained are of the type measured in the analogous field situation of wind-driven stratified lakes. (Singh-ISWS)
W76-08136

LAKE HURON SURFACE WATER TEMPERATURE, MAY-NOVEMBER, 1966,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Lab.
S. J. Bolsenga.
Water Resources Bulletin, Vol. 12, No. 1, p 147-156, February 1976. 6 fig, 2 tab, 6 ref.

Descriptors: *Lake Huron, *Great Lakes, *Temperature, Surface waters, *Water temperature, Air-water interfaces, Air temperature, Heat transfer, On-site data collections, Measurement, Isotherms.
Identifiers: *Surface water temperature, *Heat storage, Saginaw Bay, Manitoulin Island, De Tour Passage, Storage lag, Large lakes.

Data from seven vessel cruises from late May to early November permitted definition of the surface water temperature regime of Lake Huron on a monthly basis. Quantitative values were furnished for a portion of the warming, stable, and cooling periods. The lowest temperatures occurred near the center of the lake, southwest of Manitoulin Island, and at De Tour Passage. The highest temperatures occurred at the mouth of Saginaw Bay and in the southmost portions of the lake. Comparison of the surface water temperatures with temperatures in the 21-30 m layer showed the heat storage lag characteristic of large lakes. A dense network of stations which were reoccupied during a summer to early fall period was adequate for a detailed description of the surface water temperature of Lake Huron from reversing thermometer data. General agreement was shown between patterns of surface water temperature isolines from satellite images and those produced from vessel data, although different time periods prevented direct comparison. (Roberts - ISWS)
W76-08141

THE SELECTION OF PREY IN 3 MALACOPHAGOUS FISHES OF LAKE CHAD, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.
L. Lauzanne.
Cah O R S T O M Ser Hydrobiol. 9(1), p 3-7, 1975.

Descriptors: Lakes, Africa, *Predation, Fish, *Fish food organisms, *Mollusks, Invertebrates.
Identifiers: Hyperopisus-Bebe, *Malacophagous, Stomach, Synodontis-Clarias, Synodontis-Schall, *Chad(Lake Chad).

Synodontis schall, S. clarias (Mochocidae) and Hyperopisus bebe (Mormyridae) feed almost exclusively on mollusks in the area studied (Chad). The comparison between stomach contents and the benthic mollusk fauna shows that the 3 fishes select small, immature mollusks. This behavior probably influences the dynamics of the mollusk populations.--Copyright 1976, Biological Abstracts, Inc.
W76-08178

THE EFFECT OF MINERAL ENVIRONMENT ON THE GEOHYDROLOGICAL SITUATION IN LOW BOG SITES, (IN GERMAN),
Volkseigener Betriebsfestigkeit Wasserversorgung und Abwasserbehandlung, Rostock (East Germany).
A. Kirchner.
Arch Acker Pflanzenbau Bodenkd. 19(9); p 605-611, 1975.

Descriptors: *Bogs, *Hydrogeology, *Mineralogy, Environmental effects, Sites.
Identifiers: Hydrotechnical amelioration, *Minerals.

The surface relief of the environment permits only broad conclusions as to the hydrological conditions in a low bog site. The geological structure of the mineral underground, including the border region, offers valuable information on the specific geohydrological situation. Nine common natural structural types of low bogs are presented using schematic profile sections. Their geohydrological indicativeness is explained. Conclusions are drawn for hydrotechnical amelioration.--Copyright 1976, Biological Abstracts, Inc.
W76-08184

SOME PROBLEMS OF THE ECOLOGY OF THE SARY-CHILEK MARINKA SCHIZOTHORAX INTERMEDIUS EURYCEPHALUS SPELTER, (IN RUSSIAN),
Tashkent Univ. (USSR).
Z. Y. Il'yasova.
Vopr Ikhtiol. 15(2), p 226-232, 1975.

Descriptors: Fish population, Lakes, Ecology, Juveniles.
Identifiers: *Marinka, *Schizothorax-Intermedius-Eury-cephalu, *USSR(Uzbek-SSR), Lake Sary-Chilek.

The Sary-Chilek marinka S intermedius eurycephalus is widespread, and it is the only fish species in Lake Sary-Chilek in the Uzbek SSR (USSR). It occurs in small rivers and streams emptying into the lake, in neighboring lakes and in the basin of the Syr Darya. The Sary-Chilek marinka is represented by 2 morphs (typical-mouthed and thick-lipped) and 2 ecological forms (lake and river). Data are given on the ecology of juvenile and adult marinka.--Copyright 1976, Biological Abstracts, Inc.
W76-08243

AN ECOLOGIC SURVEY OF LAKE ENDINE, (IN ITALIAN),
For primary bibliographic entry see Field 5C.
W76-08244

THE EFFECT OF CONTROLLED EUTROPHICATION ON SOLAR RADIATION PENETRATING INTO PONDS, (IN POLISH),
Polish Academy of Sciences, Golysz. Fish Culture Station.
For primary bibliographic entry see Field 5C.
W76-08305

CLADOCERA AND GASTROPODA POPULATION ECOLOGY IN THE DANUBE FLOOD PLAIN, (IN ROMANIAN),
St. Negrea, and A. Negrea.
232p. Editura Academiei Republicii Socialiste Romania: Bucharest, Romania. 1975.

Descriptors: *Ecology, Europe, Flood plains, Light, *Crustaceans, *Gastropods, *Food chains, Fish food organisms, Phytoplankton, Lakes, Dams, Temperature, Winds, Ecological distribution.
Identifiers: *Romania(Danube River flood plain).

The study centers on Lakes Crapina and Jijila (Romania), and the system of smaller lakes and canals surrounding them during flood stages and, in the case of Jijila, after the erection of dams. Modifications in lake structure and morphology caused by flood conditions and by gastropod populations; effects of temperature, light and wind; an physicochemical and phytoplanktonic factors affecting population dynamics in this lake complex was discussed. The statistical methods used in the population study and the role of Cladocera and Gastropoda in food chains, including their consumption by economically important fishes, were examined. Ecologic significance and distribution of 53 cladoceran and 15 gastropod species and variation in the composition of associations according to season and flood conditions were also studied.--Copyright 1976, Biological Abstracts, Inc.
W76-08308

SOME CHARACTERISTICS OF FAT METABOLISM IN TWO FORMS OF CHAR SALVELINUS ALPINUS (L.) FROM LAKE AZABACH (KAMCHATKA), (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Ichthyology.
V. E. Matsuk, and V. I. Lapin.
Vopr Ikhtiol. 12(5), p 917-922, 1972.

Descriptors: *Metabolism, Fish food organisms, Lakes, Seasonal, *Trout.
Identifiers: *Salvelinus-Alpinus, *USSR(Lake Azabach), Fat metabolism(Fish).

The fat metabolism in a predatory and a mollusk-eating form of Salvelinus alpinus (L.) from Lake Azabach (Kamchatka) (USSR) was studied. Fat accumulation, mostly in muscles and the intestines, was observed. While the predatory form showed no significant yearly variations in its fat content, the mollusk-eating variety had maximum fat content by fall and a minimum in early spring.--Copyright 1976, Biological Abstracts, Inc.
W76-08310

CORALVILLE WATER QUALITY STUDY, ANNUAL REPORT, WATER YEAR OCTOBER 1, 1974 TO SEPTEMBER 30, 1975,
Iowa University, Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5A.
W76-08324

EUTROPHICATION OF MICROPONDS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 5C.
W76-08354

FACTORS AFFECTING THE CONTRIBUTION BY EPIPHYTIC ALGAE TO THE PRIMARY PRODUCTIVITY OF AN OLIGOTROPHIC FRESHWATER LAKE,
Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08357

PYRAMID LAKE: ZOOPLANKTON DISTRIBUTION AND BLOOMS OF THE BLUE GREEN ALGA, NODULARIA SPUMIGENA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5C.
W76-08374

THE HALTON-WENTWORTH WATERFRONT STUDY, VOLUME 1, CONCEPTS FOR WATERFRONT DEVELOPMENT (SUMMARY).
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 6B.
W76-08382

EASTERN LAKE ONTARIO PRECIPITATION NETWORK,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2B.
W76-08412

MEASUREMENTS OF CURRENT FLOW DURING SUMMER IN LAKE HURON,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
P. W. Sloss, and J. H. Saylor.
NOAA TR ERL 353-GLERL 5 (GLERL Contribution No. 56), July 1975. 39 p, 17 fig, 12 ref.

Descriptors: *Currents(Water), Flow, *Flow measurement, *Water circulation, Circulation, Velocity, *Lake Huron, Oceanography.
Identifiers: *Current vectors, Vector velocity, *Oscillatory currents, Spectra, Spectrum analysis.

Reanalyses of the data from the 1966 Great Lakes-Illinois River Basin Project (GLIRBP) of the (then) Federal Water Pollution Control Administration (FWPCA) reveal some of the large-scale, persistent summertime circulation patterns in Lake Huron. The greatest density of data from the original 45 current meter moorings covers June through August 1966, when some 21 stations returned synoptically-significant data from meters at depths of 10 and 15 m. From this somewhat sparse sample, it is deduced that at 10-m depth a counterclockwise circulation dominates the northern 2/3 of the lake. The shallower southern portion shows a more complex pattern, with generally southward flow along the shorelines on both sides and a return flow northward near the centerline of the southern basin. This latter pattern may decay later in the summer, but the data become too patchy for definite analysis. The data set from 15-m depth indicates similar circulations. Special analysis of currents at individual stations reveals a strong inertial rotation of the current vector at open-lake sites. (NOAA)
W76-08413

ELECTROPHYSIOLOGICAL STUDIES OF MORPHOLINE-IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH) AND RAINBOW TROUT (SALMO GAIRDNERI),
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08438

EXPERIMENTAL CONFIRMATION OF THE OLFACTORY HYPOTHESIS WITH HOMING, ARTIFICIALLY IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH),
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08439

NOTE ON THE DISTRIBUTION OF MERCURY IN FISH SPECIES IN THREE OHIO LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5C.
W76-08441

EFFECT OF CRUDE OIL ON POPULATIONS OF BACTERIA AND ALGAE IN ARTIFICIAL PONDS SUBJECT TO WINTER WEATHER AND ICE FORMATION,
For primary bibliographic entry see Field 5C.
W76-08453

FORMS OF PHOSPHORUS IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08527

FORMS OF IRON AND MANGANESE IN LAKE ERIE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08528

SEDIMENT YIELDS AND NUTRIENT LOADINGS FROM CANADIAN WATERSHEDS TRIBUTARY TO LAKE ERIE: AN OVERVIEW,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-08529

NUMERICAL COMPUTATIONS OF ADVECTIVE AND DIFFUSIVE TRANSPORTS OF CHLORIDE IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08530

COMPUTATIONS OF PHYSICAL TRANSPORT AND REGENERATION OF PHOSPHORUS IN LAKE ERIE, FALL 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08531

DATA ON SELECTED LAKES IN WASHINGTON, PART 3,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, G. T. Higgins, J. B. McConnell, and J. K. Innes.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 42, Part 3, 1976. 143 p, 1 fig, 28 ref.

Descriptors: *Water quality, *Lakes, *Washington, *Basic data collections, Chemical properties, Biological properties, Physical properties, Maps, Lake morphometry, Bathymetry, Aerial photography, Water analysis, Water utilization.

Chemical, biological, and physical data are included for 28 lakes in Washington. For each lake there is a description of the physical setting, a general discussion of water quality, a bathymetric map, and an aerial photograph. The basic data include depth profiles of dissolved-oxygen concentration and temperature. Each lake was sampled four times in 1972, from winter to late summer. (See also W74-12341 and W73-10654) (Woodard-USGS)
W76-08564

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 3. KITSAP, MASON, AND PIERCE COUNTIES,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, N. P. Dion, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 43, Vol 3, 1976. 259 p, 1 fig, 13 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, Data collections, Bathymetry, Aerial photography, Lake shores, Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: Western Washington lakes.

A total of 91 lakes in three counties (Kitsap, Mason, and Pierce) of western Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fathometer. By use of aerial photographs and lake depths, the bathymetric daanta were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-08565

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 4. CLARK, COWLITZ, GRAYS HARBOR, LEWIS, PACIFIC, SKAMANIA, AND THURSTON COUNTIES,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, N. P. Dion, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology Olympia, Water-Supply Bulletin 43, Vol 4, 1976. 197 p, 1 fig, 14 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, Data collections, Bathymetry, Aerial photography, Lake shores, Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: Southwestern Washington lakes.

A total of 69 lakes in seven counties (Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston) of southwestern Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fathometer. By use of aerial photographs and lake depths, the bathymetric data were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-08566

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 5. CHELAN, FERRY, KITTITAS, KLICKITAT, OKANOGAN, AND YAKIMA COUNTIES,
Geological Survey, Tacoma, Wash.
N. P. Dion, G. C. Bortleson, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology Olympia, Water-Supply Bulletin 43, Vol 5, 1976. 264 p, 1 fig, 14 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, Data collections, Bathymetry, Aerial photography, Lake shores, Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: East-central Washington lakes.

A total of 87 lakes in six counties (Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima) of east-cental Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fatometer. By use of aerial photographs and lake depths, the bathymetric data were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-08567

HYDROLOGY OF THE THREE SINKHOLE BASINS IN SOUTHWESTERN SEMINOLE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-08572

STUDY OF THE BEHAVIOUR OF TRANSURANICS AND POSSIBLE CHEMICAL HOMOLOGUES IN LAKE MICHIGAN WATER AND BIOTA,
Argonne National Lab. Ill.
For primary bibliographic entry see Field 5C.
W76-08598

PLUTONIUM AND AMERICIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W76-08606

ABUNDANCE AND BIOMASS OF BACTERIOPLANKTON OF 'TASTAKA' PONDS, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-08664

A SIX-YEAR WATER, PHOSPHORUS, AND NITROGEN BUDGET FOR SHAGAWA LAKE, MINNESOTA,
National Environmental Research Center, Corvallis, Oreg. Eutrophication and Lake Restoration Branch.
For primary bibliographic entry see Field 5C.
W76-08674

BASELINE CONCENTRATIONS OF POLYCHLORINATED BIPHENYLS AND DDT IN LAKE MICHIGAN FISH, 1971,
National Water Quality Laboratory, Duluth, Minn.
For primary bibliographic entry see Field 5A.
W76-08685

A BRIEF CHARACTERIZATION OF SHOALS AND THEIR PLANT COVER IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hydrobiologii.
I. L. Korelyakova.
Gidrobiol Zh. 11(2), p 12-17, 1975.

Descriptors: *Reservoirs, *Cover crops, *Shoals. Identifiers: Kremenchug Reservoir, Ukrainian-SSR, USSR.

Seven big shoals in the Kremenchug Reservoir (Ukrainian SSR, USSR) are characterized. The occupied area, the initial state of the flooded areas and the present state of the plant cover are discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-08697

LAKE ERIE AND ITS BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
P. G. Sly.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 355-370, March 1976. 8 fig, 28 ref.

Descriptors: *Bathymetry, Lake Erie, *Bedrock, Geology, Climates, Temperature, Land use, *Water quality, Fish stocking, Pleistocene epoch, Land development, Industries, Agriculture, Fish populations.
Identifiers: *Lake Erie basin, Settlements, Overfishing.

The bathymetry of Lake Erie was separated into Western, Central, and Eastern basins, whose form and feature have been strongly influenced by bedrock geology and the effects of Pleistocene events. The climatic regime is mid-continental but was modified by the overall effect of the Great Lakes; mean annual temperatures had a range of about 21 C. European settlement in the basin began in the early 1800's and land use patterns and historic settlement differ distinctly north and south of the lake. Changes in Lake Erie water quality are strongly associated with both agricultural and industrial development, but did not become severe until towards the end of the 1930's. However, changes and depletion of fish stocks likely owe as much to overfishing as to changes in water quality. (Roberts-ISWS)
W76-08723

CONTINUOUS DYNAMICAL COMPUTATIONS OF WATER TRANSPORTS IN LAKE ERIE FOR 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
T. J. Simons.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 371-384, March 1976. 4 fig, 1 tab, 8 ref.

Descriptors: *Model studies, *Lake Erie, *Water circulation, *Mathematical models, Computer models, Circulation, Winds, Wind tides, Wind pressure, Water levels, Thermocline, Stratification, Thermal stratification, Hypolimnion, Epilimnion, Limnology, Lakes, Distribution patterns.

A numerical model of Lake Erie has been used to compute water transports throughout the 1970 shipping season on the basis of continuous wind observations from six shore stations. A vertically integrated model was used for quasi-homogeneous conditions, and a two-layer model was employed to simulate summer stratification. The computed water circulations were retained for a study of the horizontal distribution of various chemical parameters measured by regular ship cruises on the lake during this period. Computed surface elevations were compared with observed water level data to verify the model calculations and to adjust the windstress coefficient from month to month. The coefficient of correlation between observed and computed Buffalo-minus-Toledo water setup averages out to .95 for the complete integration period. In addition, a comparison was made of model results and available data from current meters maintained in the lake during this period. The results showed the feasibility of quasi-operational applications of a model of the present type for computing the necessary water transport information for ecosystems modeling and water resources planning. (Sims-ISWS)
W76-08724

SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08725

RATES OF ACCUMULATION OF PHOSPHORUS FORMS IN LAKE ERIE SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08726

CULTURAL IMPACT ON THE GEOCHEMISTRY OF SEDIMENTS IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08727

DISTRIBUTIONS OF BOD AND DO IN RIVERS AND LAKES,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
For primary bibliographic entry see Field 5B.
W76-08743

COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W76-08746

2I. Water In Plants

ENERGY CONTENT OF THE BENTHOS AND EPIFAUNA IN THE PONGOLA RIVER, NATAL, (IN AFRIKAANS),
Potchefstroom Univ. for Ch. H. E. (South Africa). Inst. of Dierkundige Navorsing.
M. C. Roode, and C. Combrinck.
Wet Bydraes P U (Potchefstroomse Universiteit) CHO (Christelike Hoere Onderwys) Reeks B Natuurwet. 30, p 1-8, 1975.

Descriptors: *Benthos, Rivers, Africa, Aquatic animals, *Energy, Productivity.
Identifiers: Branchiura-sowerbyi, Caridina-nilotica, Natal, *South Africa(Pongola River), *Epifauna.

The collection of benthos and epifauna in the Pongola River (South Africa), completed between 1967 and 1969, was a part of the International Biological Program on freshwater productivity studies. This project was concerned with the part of the river that will be occupied by the new Strijdom Dam. A total of 53 different species were identified. A definite negative correlation existed between the mean energy value and mean mass of specimens of Branchiura sowerbyi. A greater mass increase between seasons means lower energy values. The large specimens of this species evidently have a lower energy value per gram than the smaller specimens. This finding coincides with the relatively high percentage of energy-poor mud in their intestines. Caridina nilotica has the same pattern as B. sowerbyi.--Copyright 1976, Biological Abstracts, Inc.
W76-08158

STUDIES ON THE ANIMAL COMMUNITIES IN TWO NORTH FLORIDA SALT MARSHES. PART I. FISH COMMUNITIES,
Florida Agricultural and Mechanical Univ., Tallahassee.
For primary bibliographic entry see Field 2L.
W76-08161

METHOD OF STUDYING THE SPATIAL DISTRIBUTION OF ORGANISMS, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science; and Moscow State Univ. (USSR). Dept. of Invertebrate Zoology.
For primary bibliographic entry see Field 7B.
W76-08176

MODELS OF ACTUAL COMMUNITIES,
For primary bibliographic entry see Field 8I.
W76-08219

AGE COMPOSITION AND GROWTH OF ASPIUS ASPIUS (L.) IN THE LOWER VOLGA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
L. K. Opalatenko, and A. A. Mukheisin.
Gidrobiol Zh. 11(1); p 72-78, 1975.

Descriptors: *Fish, *Rivers, *Growth rates, Age, Aging(Biological).
Identifiers: *Aspius-Aspius, Russian-SFSR, USSR, *Volga River.

On the basis of spring-summer catches of A. aspius (L.) it was determined that 4-5yr individuals 40-52 cm long weighing 800-2000 g dominated in the section of the river investigated (Russian SFSR, USSR). The most intensive growth of A. aspius (L.) occurs at the age of 2-3 yr. The fish taken for food should be larger, favoring a smaller catch of 1st yr females.--Copyright 1976, Biological Abstracts, Inc.
W76-08255

SOIL MOISTURE REGIME AND PIGMENT CONTENT IN LEAVES OF CEREALS, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Insr. of Experimental Botany.
For primary bibliographic entry see Field 3F.
W76-08304

CHANGE OF THE CONTENT AND STATE OF PIGMENTS IN LEAVES OF MALE AND FEMALE HEMP IN RELATION TO NUTRITION AND SOIL MOISTURE CONTENT, (IN RUSSIAN),
Kabardino-Balkarski Gosudarstvennyi Universitet, Nalchik (USSR).
L. K. Slonov.
Izv Sev-Kavak Nauchn Tsentra Vyssh Shk Estestv Nauki. 2(3), p 49-52, 1974.

Descriptors: *Soil moisture, *Moisture content, Chlorophyll, Nutrients, *Leaves, Fertilizers, Crop response.
Identifiers: Carotene, *Hemp leaves, Lutein, *Mineral fertilizers, Pigments, *USSR(Kabardino-Balkar ASSR), Violaxanthin.

Under field conditions in the steppe zone of the Kabardino-Balkar ASSR (USSR) the effect of mineral fertilizers and of a combination of mineral and organic fertilizers on the control of chlorophylls a and b in hemp leaves on unirrigated and irrigated lands was studied. Greater production of chlorophyll occurred in the leaves of the female plants than in the male. Fertilizer promoted an increase in the strength of the bond of chlorophyll to the protein-lipid complex in the leaves, especially in female plants. The effect of mineral and organic-mineral fertilizers was expressed also in an increase in the content of carotene, lutein and violaxanthin in leaves, especially in female plants.--Copyright 1976, Biological Abstracts, Inc.
W76-08306

CARBOHYDRATE TRANSFORMATION IN WHEAT AND RYE PLANTS UNDER EFFECT OF FLOODING IN THE AUTUMN-WINTER PERIOD, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
For primary bibliographic entry see Field 3F.
W76-08307

THE STATE OF WATER IN PLANT TISSUES AT NEGATIVE TEMPERATURES UNDER NATURAL CONDITIONS, (IN RUSSIAN),
Kirov Agric. Inst., Kirov, USSR.
L. I. Krasovskii, and V. A. Chashchukhin.
Fiziol Rast. 21(5); p 975-979, 1974.

Descriptors: *Moisture content, *Plant tissues, *Environmental effects, *Cold resistance.
Identifiers: Abies-Sibirica, Acer-Negundo, Betula-Pendula, Juniperus-Communis, Pinus-Sylvestris, Populus-Tremula, Salix-Triandra, Vaccinium-Myrtillus, Cold temperatures.

The content of non-frozen water was studied in living tissues and tissues and tissues killed by boiling of woody plants under natural conditions in the winter of 1970-1971 and in the winter of 1971-1972. The following plants were studied: Pinus silvestria (= P. sylvestris) (pine-needles), Abies sibirica, Juniperus communis, Populus tremula, Vaccinium myrtillus, Acer negundo, Betula pendula and Salix triandra. At -10C, 40% water in P. silvestris and 60% water in V. myrtillus did not freeze. Non-frozen water was found in the living and in the killed plants. Extracellular water presumably did not freeze in the living branches.--Copyright 1976, Biological Abstracts, Inc.
W76-08368

REARING THE SEVAN TROUT AT THE AIGERLICH TROUT POND FISHERY, (IN ARMENIAN),
M. E. Gambaryan, and G. A. Oganesyan.
Biol Zh Arm. 28(1), p 106-108, 1975.

Descriptors: *Trout, *Fisheries, *Growth rates, Fish stocking, Fish reproduction.
Identifiers: Aigerlich Trout Fishery, Armenian-SSR, Gegarkuni, *Sevan trout, USSR.

Experiments carried out in 1970-1971 showed that it is possible to rear commercial Sevan trout (Salmo ischchan gegarkuni) in the Aigerlich trout pond fishery of the Ararat Valley (Armenian SSR, USSR). The Sevan trout surpasses the rainbow trout in rate of growth.--Copyright 1976, Biological Abstracts, Inc.
W76-08371

ECOLOGY AND PROSPECTS OF USING THE AMPHIPOD GAMMARUS (R.) BALCANICUS SCHAEF, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
I. A. Zubchenko.
Vestn Zool. 3, p 42-47, 1975.

Descriptors: *Ampiphoda, *Fish food organisms, *Cultivation.
Identifiers: *Fish food, Amphipod, *Gammarus-Balcanicus, USSR, Caucasus, Carpathian area.

G. balcanicus Schaf. is a high-quality food for domestic animals and fish. Experiments showed the development of methods for its mass cultivation to be feasible. The Carpathian area and Caucasus (USSR) are potential regions for collection of these animals.--Copyright 1976, Biological Abstracts, Inc.
W76-08410

STUDY OF SELF-DIFFUSION OF WATER AND ITS ACTIVATION ENERGY IN CELLS OF DIFFERENT PLANT TISSUES, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
F. G. Miftakhutdinova, A. V. Anisimov, and G. A. Velikanov.
Fiziol Biokhim Kul't Rast. 7(3),p 298-300, 1975.

Descriptors: *Plant tissues, Moisture uptake, Movement, Beans, Corn(field), Temperatures, Diffusion.
Identifiers: Cucumbers, Peas.

In different plant tissues (pea, bean, corn, cucumber) the activation energy of intracellular water self-diffusion within a temperature range of 20-45C is practically the same as that of pure water and within a region of 5-25, it is the same or somewhat lower. The absolute level of values of the coefficient of water self-diffusion in a cell and of the activation energy shows that the bulk of intracellular water, except for water of hydration, does not differ essentially by its structure and properties from pure water.--Copyright 1976, Biological Abstracts, Inc.
W76-08429

POSSIBILITY OF DETERMINING THE RATE OF SEASONAL RADIAL GROWTH OF TRUNKS AND CHANGES IN THE WATER REGIME OF TREES USING A PHOTOMETRIC CURVE, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
E. A. Vaganov, V. V. Smirnov, and I. A. Terskov.
Ekologiya. 6(2), p 45-53, 1975.

Descriptors: *Trees, *Growth, *Seasonal, *Regimes, *Moisture availability, *Growth rates, *Analytical techniques, *Photometry, Xylem.
Identifiers: Trunks(Trees), Growth rings.

The relation between the reflection of light by structural elements of the annual rings and radial growth rate of spruce trees was investigated. The porosity distribution of the wood correlates with the growth rate of the xylem cells during the vegetation period. Local decreases in porosity of individual zones of the annual rings occur as a consequence of changes in the tree's water regime. The possibility of using photometric curves for analyzing the seasonal growth of the trunk and other tree parts is discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-08521

AN AQUATIC TECHNIQUE FOR COLLECTING SMALL ADULT INSECTS,
Murray State Univ., Ky.
For primary bibliographic entry see Field 7B.
W76-08574

AN EXPERIMENT ON THE FEEDING OF FRY OF CATFISH HETEROPNEUSTES FOSSILIS,
Bangladesh Agricultural Univ., Mymensingh. Faculty of Fisheries.
M. F. Huq, M. K. Haque, I. Haque, and A. K. M. Aminul.
Indian J Fish. 20(1), p 35-42, 1973.

Descriptors: *Catfishes, *Fry, *Fish diets.
Identifiers: Heteropneustes-Fossilis.

An experiment was conducted to determine a suitable feed for the fry of catfish, H. fossilis. Of the 6 types of feed tried, 5 had a common base of vegetable origin. The feeds differed only in their animal protein components. Feed I (with meat offal and fish meal) and Feed II (with meat offal and blood meal) and Feed III (with lysine-cummethionine) gave the best results. Feed consisting of only fish meal with no vegetable base resulted in weight reduction of the fry.--Copyright 1975, Biological Abstracts, Inc.
W76-08575

EFFECT OF SOLAR ENERGY AND WATER ON PLANT PRODUCTIVITY (IN BULGARIAN),
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Hydrotechnical Lab.
H. C. Aslyng.
Fiziol Rast (Sofia) 1(2), p 103-114, 1974. (Engl. summ.).

Descriptors: *Plant growth, *Solar radiation, *Moisture availability, *Analytical techniques, Measurement, Plant physiology, Corn sugar cane, *Carbon dioxide.

The activities of the Hydrotechnical Laboratory and the attached Climatic and Water Balance Station (Denmark) are discussed. Facilities and methods for recording climatic and plant physiological data are described. Results are reported for different parameters determining plant (corn, sugarcane) production, such as solar energy for photosynthesis, light requirement and the rate of different factors providing for maximum production. The effect of CO2 was especially considered.
W76-08576

ZOOPLANKTON SURVIVAL IN COOLING WATER SYSTEMS OF FOUR THERMAL POWER PLANTS ON THE CALIFORNIA COAST-INTERIM REPORT. MARCH 1971-JANUARY 1972,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
For primary bibliographic entry see Field 5C.
W76-08630

ROLE OF GROUNDWATERS IN REDISTRIBUTION OF SOLAR RADIATION BY A PHYTOCENOSIS, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Inst. of Experimental Botany.
L. P. Smolyak, U. R. Reutski, V. R. Filistovich, and Zh. I. Kazlova.
Vyestsi Akad Navuk B SSR Syer Biyal Navuk. 1, p 30-35, 1975.

Descriptors: *Solar radiation, *Groundwater, *Plant growth, Leaves, *Soil-water-plant relationships.
Identifiers: *Phytocenosis.

An investigation of the effect of groundwater on phytoclimate established that, depending on depth, a certain amount of water and air is found in the arable soil horizon which determines growth and leaf vigor in the phytocenose. The leaf surface of plants actively participates in the redistribution of solar energy. The quantity of solar radiation reflected and adsorbed by the crop and redistributed by the soil was established. The data are compared with the leaf index and groundwater level.--Copyright 1975, Biological Abstracts, Inc.
W76-08665

DEPENDENCE OF STOMATAL NUMBER AND SIZE IN JUGLANS REGIA L. ON ECOLOGICAL CONDITIONS, (IN BULGARIAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Botany.
N. Jotsova-Baurenska.
Fitologiya. 1, p 19-24, 1975.

Descriptors: Trees, *Stomata, *Water requirements, Moisture stress, Soil-water-plant relationships, Ecology.
Identifiers: Ecological, Exposure, Juglans-Regia, *Persian walnut, Walnut.

Measurements were made on stomatal number and size in J. regia L. under different ecological conditions. The results were related to the water regime of the Persian walnut. Reduction of soil moisture and higher meteorological stress led to a greater number of stomata, reduced moisture content in the leaves and an increased water deficit. This relationship was best expressed in walnuts growing on talus and having a southern exposure.--Copyright 1976, Biological Abstracts, Inc.
W76-08668

2J. Erosion and Sedimentation

USE AND MISUSE OF THE UNIVERSAL SOIL LOSS EQUATION,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
W. H. Wischmeier.
Journal of Soil and Water Conservation, Vol. 31, No. 1, p 5-9, January-February 1976. 2 fig, 10 ref.

Descriptors: *Soil erosion, *Equations, *Erosion control, *Farm management, *Runoff, *Soil conservation, Sheet erosion, Sediment yield, Soil types, Rill erosion.
Identifiers: *Soil loss equation, Soil-erodibility factor, Iso-erodent map.

The universal soil loss equation was designed to predict soil loss from sheet and rill erosion. Variables affecting this erosion are grouped under six major erosion factors related to erosive forces of rainfall and runoff, inherent erodibility of a particular soil, shape and slope characteristics of the field, farm practices, and land management. The relation of a particular factor to soil loss is often appreciably influenced by the levels at which other factors are present. Computed soil loss is the best available estimate rather than an absolute value. The soil loss equation can be used to predict average annual soil movement to guide the selection of suitable conservation practices, to estim the comparative utility of cropping systems, to determine optimum level of cropping and maximum tolerable slopes, and to provide soil loss data for erosional control needs. The researcher has to exercise judgment in selecting pertinent factor values that will account for differences from averages and for differences from field conditions and normal field operations. (Singh - ISWS)
W76-08120

SUSPENDED MATERIAL TRANSPORT: NARRAGANSETT BAY AREA, RHODE ISLAND,
Rhode Island Univ., Kingston, Graduate School of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08139

OREGON COAST SHORELINE CHANGES DUE TO JETTIES,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 8B.
W76-08342

SIMULATION OF HYDRAULIC PROCESSES IN OPEN CHANNELS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-08344

AN IGNITION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN LAKE SEDIMENTS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 5A.
W76-08346

THE PLANKTON TOWER. I. A STRUCTURE TO STUDY WATER/SEDIMENT INTERACTIONS IN ENCLOSED WATER COLUMNS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W76-08446

THE PLANKTON TOWER. II. RELEASE OF NUTRIENTS FROM SEDIMENTS DUE TO CHANGES IN THE DENSITY OF BOTTOM WATER,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W76-08447

THE GROUNDWATER OUTCROP-EROSION MODEL; EVOLUTION OF THE STREAM NETWORK IN THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Instituut voor Aardwetenschappen.
For primary bibliographic entry see Field 2A.
W76-08515

THE ROLE OF ORGANIC DETRITUS IN THE FORMATION OF DISTINCTIVE SANDY TIDAL FLAT SEDIMENTARY STRUCTURES, TAY ESTUARY, SCOTLAND,
Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center.
For primary bibliographic entry see Field 2L.
W76-08524

MERCURY IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08526

FORMS OF PHOSPHORUS IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08527

FORMS OF IRON AND MANGANESE IN LAKE ERIE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08528

SEDIMENT YIELDS AND NUTRIENT LOADINGS FROM CANADIAN WATERSHEDS TRIBUTARY TO LAKE ERIE: AN OVERVIEW,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-08529

COMPUTATIONS OF PHYSICAL TRANSPORT AND REGENERATION OF PHOSPHORUS IN LAKE ERIE, FALL 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08531

SOIL LOSS FROM ILLINOIS FARMS - ECONOMIC ANALYSIS OF PRODUCTIVITY LOSS AND SEDIMENTATION DAMAGE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4D.
W76-08533

FUNDAMENTAL ASPECTS OF EROSION OF COHESIVE SOILS,
California Univ., Davis. Dept. of Civil Engineering.
K. Arulanandan.
Journal of the Hydraulics Division, Proceeding ASCE, Vol. 101, No. HY5, p 635-639, May 1975. 4 fig, 1 tab, 11 ref.

Descriptors: *Erosion, *Cohesive soils, Erosion rates, *Dispersion clays, Mineralogy, Pores, *Cation exchange, Ion exchange, Soil types, *Soil erosion.
Identifiers: Soil swelling, Cation exchange capacity.

The influence of soil systems at different dispersed states on erodibility and swelling is well demonstrated. The degree of dispersion of the soil as influenced by mineralogy, amount of clay, soil pore fluid, (SAR), concentration of pore fluid, and the differences in the concentration between the pore and eroding fluids have to be considered in evaluating the erosion potentials of soils. For prediction of erodibility, a tentative relationship between cation exchange capacity (CEC) (a value which varies with or depends on the type of clay) and critical shear stress at a particular concentration of pore fluid at low and high values of SAR is presented. Experimental and theoretical investigation of erosion is in progress to obtain a functional relationship between structural parameters quantified in terms of electrical properties and erodibility. (Skogerboe - Colorado State)
W76-08540

WATERSHED SOIL DETACHMENT AND TRANSPORTATION FACTORS,
Agricultural Research Service, Morris, Minn.
C. A. Onstad, and W. C. Moldenhauer.
Journal of Environmental Quality, Vol. 4, No. 1, p 29-33, January-March 1975. 2 fig, 21 ref.

Descriptors: *Simulation analysis, Model studies, *Sediment transport, Erosion, Erosion rates, *Sediment yield, Watershed management, *Agricultural watersheds.

Quantification of sediment yields from agricultural watersheds requires that consideration be given to spatial and temporal variations in the parameters known to influence soil erosion by water. This includes accounting for variations in rainfall and runoff, the energy sources, on a storm-by-storm basis. Also to be considered are the distribution of watershed topography, soils, tillage practices, and vegetation which influence the degree of erosion or deposition. These factors are discussed with regard to simulation of the erosion-deposition continum on agricultural watersheds. (Skogerboe-Colorado State)
W76-08551

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1974,
Geological Survey, Anchorage, Alaska.
J. M. Childers, and S. H. Jones.
Open-file report, 1975. 145 p, 93 fig, 1 tab, 10 ref.

Descriptors: *Channel erosion, *Construction, *Pipelines, *Oil, *Alaska, Surveys, Aerial photography, Streams, Channel morphology, Environmental effects, Erosion control, Monitoring.
Identifiers: *Pipeline stream crossings(Alaska), Trans-Alaska Pipeline System.

Repeated site surveys and aerial photographs at 26 stream crossings along the trans-Alaska pipeline system (TAPS) route during the period 1969-74 provide chronologic records of channel changes that predate pipeline-related construction at the sites. The 1974 surveys and photographs show some of the channel changes wrought by construction of the haul road from the Yukon River to Prudhoe Bay and by construction of camps and working pads all along the pipeline route. No pipeline crossings were constructed before 1975. These records of channel changes together with flood and icing measurements are part of the U.S. Department of the Interior's continuing surveillance program to document the hydrologic aspects of the trans-Alaska pipeline and its environmental impacts. (Woodard-USGS)
W76-08559

THE PLACER RIVER SILT--AN INTERTIDAL DEPOSIT CAUSED BY THE 1964 ALASKA EARTHQUAKE,
Geological Survey, Menlo Park, Calif.
A. T. Ovenshine, D. E. Lawson, and S. R. Bartsch-Winkler.
Journal of Research of the U.S. Geological Survey, Vol 4, No 2, p 151-162, March-April 1976. 11 fig, 1 tab, 5 ref.

Descriptors: *Sedimentation, *Earthquakes, *Alaska, *Sediment transport, *Tidal waters, Silts, Movement, Erosion, Environmental effects.
Identifiers: *Anchorage area(Alaska).

At the head of Turnagain Arm near Anchorage, the major lasting geologic consequence of the Alaska earthquake of 1964 was deposition of the Placer River Silt, an intertidal deposit covering an area of more than 18 sq km and containing more than 120 cubic metres of sediment. This averages 1.5 m thick seaward of the Seward Highway and 0.9 m thick landward. Its distribution is controlled both by the arrangement of the major streams that enter tidewater and by manmade features such as the highway and railroad enbankments. The Placer River Silt is still being deposited. The contemporary lowland sedimentation system of the Portage area includes a number of depositional settings: (1) In the Placer River Silt--upper tidal flats, levees, and channelway fans, (2) elsewhere in the intertidal zone--tidal stream channels, lower tidal flats, and saltwater marsh, and (3) in the supratidal zone--gravel levees, freshwater marsh, bogs, and lakes. Since 1964, the critical environmental results of the earthquake-caused deposition have been abandonment of the settlement of Portage, formation of an unsightly blanket of silt, destruction of natural plant communities, localized erosion, and creation of quicksand hazards. (Woodard-USGS)
W76-08560

DISTRIBUTIONS OF TRANSURANIUM NUCLIDES IN SEDIMENT AND BIOTA OF THE NORTH ATLANTIC OCEAN,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-08602

PLUTONIUM AND AMERICIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W76-08606

PROCEDURE FOR PLUTONIUM ANALYSIS OF LARGE (100 G) SOIL AND SEDIMENT SAMPLES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W76-08613

FIELD PERFORMANCE OF PERMEABLE BREAKWATER,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 8A.
W76-08684

ENERGY TRANSFER IN SEDIMENTARY ENVIRONMENTS: THE CASE OF SULFATOREDUCERS: I. THE ORGANIC ACIDS IN LAGOON AND MARINE SEDIMENTS (GOLFE DU LION), (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
For primary bibliographic entry see Field 5C.
W76-08718

SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
R. L. Thomas, J-M. Jaquet, A. L. W. Kemp, and C. F. M. Lewis.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 385-403, March 1976. 16 fig, 4 tab, 37 ref.

Descriptors: *Sediments, *Lake Erie, *Sediment distribution, *Lake sediments, On-site investigations, Sampling, Remote sensing, Bathymetry, Sediment sorting, Sediment-water interfaces, Silts, Sands, Clays, Carbon, Quartz, Bottom sediments, Sedimentation, Oxidation-reduction potential, Hydrogen ion concentration, Limnology, Sedimentology.
Identifiers: Sediment composition, Surficial sediments.

On the basis of extensive echosounding and grab sampling, three major units have been recognized in Lake Erie: till and bedrock, glaciolacustrine clay, and postglacial muds. These units represent the late glacial and post glacial evolution of the basin and occur in an offshore younging sequence. The main basin of the lake is subdivided by residual glacial moraines into four depositional basins: Western, Sandusky, Central, and Eastern basins. The sediment texture has been defined by moment measures (mean, standard deviation, skewness, and kurtosis), the trends of which are related to the mixing of two primary grain-size populations in the sand- and clay-size ranges. A third grain-size mode in the silt size, composed of fine quartz with some carbonate, has been recognized. This mode has a modifying effect on the symmetry of the two primary populations and may, to some extent, be sufficiently abundant to behave as a discrete population. The interrelationships of parameters indicated textural dependence on mineralogic composition, particularly important being the relationship of clay concentration to mean grain size. This has particular value in modelling the physical behavior of clay-associated geochemical elements such as phosphorus. (Sims-ISWS)
W76-08725

RATES OF ACCUMULATION OF PHOSPHORUS FORMS IN LAKE ERIE SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. D. H. Williams, T. P. Murphy, and T. Mayer.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 430-439, March 1976. 4 fig, 3 tab, 21 ref.

Descriptors: *Phosphorus, *Lake Erie, *Lake sediments, *Sedimentation rates, *Phosphorus compounds, *Great Lakes, Water pollution sources, Surface waters, Sedimentation, Sediments, Sediment distribution, Distribution patterns, Sediment-water interfaces, Lakes, Phosphates, Analytical techniques, Inorganic compounds, Cores, Sampling, On-site investigations, Sediment load.
Identifiers: Phosphorus forms, Phosphorus accumulation, Apatite phosphorus, Nonapatite phosphorus, Surficial sediments, Apatite.

Six Lake Erie sediment cores from locations of widely different sedimentation rates showed that rate of input and sedimentation of apatite phosphorus at a given locality has been approximately constant during the last few hundred years relative to total sedimentation rate at the same locality. Apatite is not a significant source of soluble phosphorus for Lake Erie. By contrast, rate of sedimentation of nonapatite inorganic phosphorus (NAIP) and organic phosphorus has steadily increased in accordance with increased loadings in recent years of the source material, namely phosphorus of anthropogenic origin. The rate of sedimentation of these two forms of phosphorus at a given locality varied greatly within the lake, and was greatest where the most fine-grained sediments were accumulating. It was concluded that the sediments of Lake Erie contain sufficient

orthophosphate-retaining sites to prevent major regeneration of phosphate under any conceivable condition provided the overlying water remains oxic. (Henley - ISWS)
W76-08726

CULTURAL IMPACT ON THE GEOCHEMISTRY OF SEDIMENTS IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
A. L. W. Kemp, R. L. Thomas, C. I. Dell, and J.-M. Jaquet.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 440-462, March 1976. 8 fig, 12 tab, 88 ref.

Descriptors: *Sediments, *Lake Erie, *Geochemistry, *Lake sediments, Sampling, Cores, Chemistry, Nutrients, Deposition(Sediments), Silts, Sedimentation rates, Sedimentation, Oxidation-reduction potential, Limnology, Sedimentology.
Identifiers: Sediment composition, Cultural effects, Sediment sources.

The chemical and physical characteristics of six cores from Lake Erie were described. The concentrations of Si, A1, K, Na, and Mg, which represent the major mineral species in the sediment, were uniform in each core. Surface enrichments of Hg, Pb, Zn, Cd, Cu, Organic-C, N, and P were observed at each location, due mainly to the increasing anthropogenic loading of these elements to the sediments since 1850. Concentration profiles for Mn, Fe, and S were related to sediment Eh and are due to mobilization of these elements in the pore waters. Natural and anthropogenic inputs of nutrients and heavy metals were calculated. About 60% of the total loading of these elements is being deposited in the Eastern basin. It was calculated that 30 million metric tons of fine-grained sediment accumulates in the offshore basins of the lake, each year. The major source of the sediment input is erosion of the shoreline bluffs, with the north shore between Erieau and Long Point contributing 21 million metric tons annually. A sediment mass balance suggested that a large part of this bluff material is transported up to 150 km and is deposited in the Eastern basin. (Sims - ISWS)
W76-08727

A PHYSICAL MODEL FOR THE RATE OF DEPOSITION OF FINE-GRAINED SEDIMENTS IN THE DEEP SEA,
Oregon State Univ., Corvallis. School of Oceanography.
I. N. McCave, and S. A. Swift.
Geological Society of America Bulletin, Vol. 87, No. 4, p 541-546, April 1976. 3 fig, 4 tab, 47 ref. ONR N00014-67-A-0369-0007.

Descriptors: *Model studies, *Sedimentation, *Oceans, Mathematical models, Sedimentation rates, Settling velocity, *Deposition(Sediments), Suspended solids, Particle size, Boundary layers, Turbulent boundary layers, Erosion, Silting, Sedimentology.
Identifiers: Nepheloid layer, Critical deposition conditions.

A model for the net entrapment of fine suspended sediment in the viscous sublayer of a turbulent boundary layer yielded an expression of the same form as one derived previously on an empirical basis. The expression was modified by a factor that takes into account the reduction in rate of deposition caused by occasional erosion, bottom roughness, and organic resuspension. A curve for the variation in critical deposition shear stress with particle settling velocity was constructed using the assumption that the critical deposition stress is equal to the critical erosion stress for fine noncohesive material. Application of the model to post-glacial deposition rates using modern concentration data gave reasonable agreement and suggested values of the factor little less than unity. The model involved assumption of a constant near-bed suspended sediment concentration. An alternative case of decrease in concentration with distance along the flow path showed that the grain-size modes in the deposited sediment resemble the pattern of size modes found north of the Carnegie Ridge in the Panama Basin. (Sims - ISWS)
W76-08736

DISTRIBUTION, COMPOSITION, AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE VICINITY OF WILLAPA SUBMARINE CANYON, WASHINGTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08737

USE OF SURFACE-ACTIVE CHEMICALS IN PUMP-ASHORE SCHEMES AND SUCTION DREDGERS,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 8C.
W76-08747

2K. Chemical Processes

EVALUATION OF METHODS FOR PRESERVING THE LEVELS OF SOLUBLE INORGANIC PHOSPHORUS AND NITROGEN IN UNFILTERED WATER SAMPLES,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
For primary bibliographic entry see Field 5A.
W76-08157

AN IMPROVED METHOD FOR DETERMINATION OF THE CHEMICAL OXYGEN DEMAND WITH POTASSIUM DICHROMATE (COD-METHOD) (EINE VERBESSERTE METHODE ZUR BESTIMMUNG DES CHEMISCHEN SAUERSTOFFBEDARFS MIT KALIUM-DICHROMAT) (COD-METHODE),
For primary bibliographic entry see Field 5A.
W76-08256

MEASUREMENT METHOD FOR DISSOLVED AMMONIA NITROGEN IN WATER (YOZON ANMONIASEI CHISSO NODO SOKUTEIHO),
For primary bibliographic entry see Field 5A.
W76-08261

ABSORPTIOMETRIC DETERMINATION OF IRON WITH T.P.T.Z.,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 5A.
W76-08273

ESTIMATING WATER SALINITY WITH GEOPHYSICAL EARTH RESISTIVITY EQUIPMENT,
Agricultural Research Service, Sidney, Mon.
A. D. Halvorson, and C. A. Reule.
Soil Science Society of America Journal, Vol. 40, No. 1, p 152-153, January-February 1976. 2 fig, 1 tab, 5 ref.

Descriptors: *Conductivity, *Electrical conductance, *Resistivity, *Salinity, *Chemical properties, Chemical analysis, Analytical techniques, Analysis, Physical properties, Electrical properties, Water properties, Saline water, Saline soils, Water quality, On-site tests, Instrumentation, Equipment, Estimating, Geophysics.
Identifiers: *Solution conductivity, *Four-electrode conductivity cell, *Geophysical resistivity meter.

A procedure was described for estimating salinity of water samples in the field using a geophysical earth resistivity meter and four-electrode conductivity cell. Using field collected water samples, a linear relationship of $Y = 1.02(X) + 0.12, r = 0.996$, was obtained between EC sub 25 values determined using a commercial laboratory bridge and cell (Y), and those determined using an earth resistivity meter and an easily fabricated, four-electrode conductivity cell (X). (Henley-ISWS)
W76-08332

DETERMINATION OF TOTAL NITROGEN IN NATURAL WATERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. W. Nelson, and L. E. Sommers.
Journal of Environmental Quality, Vol. 4, No. 4, p. 465-468, 1975. 6 tab., 9 ref.

Descriptors: *Analytical techniques, *Methodology, *Water analysis, *Nitrogen, Vapor compression distillation, Nitrogen compounds, *Pollutant identification.
Identifiers: Kjeldahl method.

Total nitrogen determinations in natural waters are complicated because numerous forms of nitrogen are present. Nitrates are frequently present in substantial amounts and require pretreatment to be quantitatively reduced to ammonia, which is measured by the Kjeldahl nitrogen method. Nitrate recovery from plant materials, fertilizers, and soils succeed when samples are pretreated with reduced iron in acid media. Hydrogen generated by the iron-with-acid reaction apparently acts as a reducing agent. In the proposed method water samples are evaporated and pretreated with reduced iron and sulfuric acid, followed by Kjeldahl digestion to recover organic nitrogen. Ammonia in the digestion mixture is estimated by steam distillation and titration. Nitrate and organic nitrogen recovery is affected by the brand and amount of reduced iron used and boiling the sample gently with reduced iron and sulfuric acid before digestion. The method measures up to 2 mg total nitrogen and 0.5 mg nitrate nitrogen in filtered or unfiltered river and pond waters. It is simple, precise, more rapid than other methods, and can measure all forms of nitrogen commonly found in natural and waste waters. Organic nitrogen can be calculated by subtracting inorganic nitrogen from the total nitrogen found. (Buchanan-Davidson--Wisconsin)
W76-08355

REASSESSMENT OF MERCURY IN SURFACE WATER IN THE ADIRONDACK REGION, NEW YORK,
Geological Survey, Ithaca, N.Y.
W. Buller.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 223-226, March-April 1976. 1 fig, 1 tab, 11 ref.

Descriptors: *Mercury, *Natural streams, *Water analysis, Analytical techniques, *New York, Sampling, *Pollutant identification.
Identifiers: *Adirondack region(NY), Sample preservation.

A study in 1970 established a natural background concentration of mercury in surface water in the Adirondack region of New York. In 1974, new methods of sample preservation and analysis were used in determining concentrations of mercury of samples of water from the same surface-water sites sampled in 1970-71. Concentrations of mercury for all sites in the 1974 study were virtually the same as those obtained in 1970-71, less than 0.5 microgram per litre. The analytical methods are described. (Woodard-USGS)
W76-08554

SELECTED HYDROLOGIC DATA, CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.

For primary bibliographic entry see Field 7C.
W76-08557

GEOLOGY AND WATER RESOURCES OF MARSHALL COUNTY, SOUTH DAKOTA--PART 1: GEOLOGY AND WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-08558

WATER QUALITY IN THE MAD RIVER BASIN, HUMBOLDT AND TRINITY COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-08562

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN BRAZORIA, FORT BEND, AND WALLER COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08569

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1970-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08570

REFERENCE METHODS FOR MARINE RADIOACTIVITY STUDIES II.
International Lab. of Marine Radioactivity, Vienna (Austria).
For primary bibliographic entry see Field 5A.
W76-08608

QUALITY CONTROL IN RADIOCHEMICAL ANALYSIS,
New York Operations Office (AEC), N. Y. Health and Safety Div.
For primary bibliographic entry see Field 5A.
W76-08609

ISOTOPIC ANALYSIS OF PLUTONIUM IN ENVIRONMENTAL SAMPLES BY ISOTOPE DILUTION MASS SPECTROMETRY,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W76-08612

COMPARISON OF TWO PREDICTIVE NONEQUILIBRIUM ONE-DIMENSIONAL MODELS FOR PHOSPHORUS SORPTION AND MOVEMENT THROUGH HOMOGENEOUS SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08677

THE SIGNIFICANCE AND VARIATION OF ATMOSPHERIC NUTRIENT INPUTS IN A SMALL CATCHMENT SYSTEM,
Sheffield Univ. (England), Department of Geography.
For primary bibliographic entry see Field 5A.
W76-08728

2L. Estuaries

MARINE ECOLOGY OF THE NORTHERN EUBOEA: I. PRELIMINARY DATA ON THE ZOOPLANKTON AND THE ICHTYOPLANKTON, (IN FRENCH),
Athens Univ. (Greece). Zoological Lab. and Museum.
C. Yannopoulos, and J. M. Barrois.
Biol Gallo-Hell. 6(1), p 125-133, 1975.

Descriptors: Ecology, *Zooplankton, Larvae, Europe, Marine biology, Marine animals, Plankton, *Teleasts, *Biomass, Crustaceaus, Copepods.
Identifiers: Acartia-Clausi, *Greece(Euboea gulf region), *Ichthyo plankton, Penila-Avirostris, Agean Sea.

The zooplankton (biomass, species composition) and the ichthyoplankton (larvae) were studied from samples obtained in 1974 during 5 cruises in the north Euboea gulf region (Greece). Biomass estimations presented the same low values (1.3-2.9 mg/m3) as those from the open Aegean Sea, with the exception of the Pagasitikos Gulf (near Volos) where higher values were found (17.2 mg/m3). Almost all zooplanktonic groups were found in this area. The copepod Acartia clausi dominates during spring (70%-90%) and the cladoceran Penilia avirostris during summer (74%-93%). In the ichthyoplankton, 28 spp. of teleosts were identified.--Copyright 1976, Biological Abstracts, Inc.
W76-08106

COASTAL CIRCULATION AND PHYSICAL OCEANOGRAPHY OF THE SCOTIAN SHELF AND THE GULF OF MAINE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
W. H. Sutcliffe Jr, R. H. Loucks, and K. F. Drinkwater.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 1, p 98-115, January 1976. 10 fig, 3 tab, 127 ref.

Descriptors: St. Lawrence River, *Gulfs, *Ocean currents, *Ocean circulation, *Temperature, *Salinity, Commercial fish, Mixing, Upwelling, Circulation, Water circulation, Currents(Water), Sea water, Oceanography, Coasts, Estuaries, Weather, Winds, Discharge(Water), Correlation analysis, *Canada.
Identifiers: *Gulf of St. Lawrence, *Gulf of Maine, Scotian Shelf, Bay of Fundy, Labrador Current.

Correlations between annual catch of coastal commercial species of fish and the environmental factors of sea temperatures and St. Lawrence River discharge have led to an investigation of the relationship between the latter. Examining year-to-year variability of monthly means, effects of the St. Lawrence River discharge can be traced by correlation analysis with sea temperatures to propagate from the Gulf of St. Lawrence onto the Scotian Shelf and through the Gulf of Maine at known coastal current drift speeds. Seasonal salinity and transport data support such a flow at least to a section off Halifax on the Scotian Shelf. Within the Gulf of Maine seasonal salinities do not support continuity of flow; however, possible reasons and mechanisms for this were discussed. Other factors such as local river runoff in the Gulf of Maine, Labrador Current, and large-scale weather systems were briefly considered and discussed. It was proposed that the Gulf of St. Lawrence to the Gulf of Maine inclusive be considered as an oceanographic system and events occurring in the southern part on time scales of a month or more are not independent of more northerly events. It was not interpreted that the river discharge is the driving force of such an oceanographic system but rather influences the water properties within the source region of the flow, i.e., the Gulf of St. Lawrence. Some biological implications of the Gulf of St. Lawrence to Gulf of Maine pathway were pointed out. (Bender - ISWS)
W76-08125

SURFACE CIRCULATION PATTERN IN THE GULF OF ST. LAWRENCE,
Quebec Univ., Rimouski. Dept. of Oceanography.
M. I. El-Sabh.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 1, p 124-138, January 1976. 14 fig, 1 tab, 36 ref.

Descriptors: *Ocean circulation, *Ocean currents, *Density, *Gulfs, *Upwelling, St. Lawrence River, Circulation, Water circulation, Currents(Water), Mixing, Density currents, Sea water, Nutrients, Estuaries, Oceanography, Coasts, Salinity, Temperature, Weather, Winds.
Identifiers: *Gulf of St. Lawrence, Geostrophic currents, Laurentian Channel, Gyres(Cyclonic and anticyclonic).

Using all available oceanographic data in the Gulf of St. Lawrence between 1950 and 1969, a network of average stations was formed for the months of June, July, August, November, and for the winter period. The dynamic method was applied to calculate the geostrophic circulation in the Gulf during these months based on a variable reference layer. The main features of the reference layer are the steep slope along the Gaspe coast and the existence of three depressions in the Laurentian Channel, southeast and west of Anticosti Island, and in the central region of Cabot Strait. Its depth varies from 10 to 50 m in the Magdalen Shallows to more than 300 m in part of the Laurentian Channel. The general two-way flow in all entrances to the Gulf, the existence of a permanent anticlockwise gyre west of Anticosti Island, and the Gaspe and Cape Breton currents with which are associated the highest velocities in the Gulf are the main features of the circulation pattern. The circulation patterns obtained agree with the results of synoptic observations. Cyclonic and anticyclonic gyres are common in the Gulf. A comparison of the circulation patterns obtained in this study and the results of the International Biological Programme Study of the Gulf revealed that such cyclonic and anticyclonic gyres are responsible, at least in part, for the areas of maximum primary productivity west and northeast of Anticosti Island, and for the so-called 'desert areas' in the northeastern side of the Gulf. (Bender - ISWS)
W76-08126

ON A THERMAL LAG IN THE NORTH ATLANTIC OCEAN DURING A CLIMATIC CHANGE,
Ocean-Atmosphere Research Inst., Cambridge, Mass.
I. I. Schell, and D. A. Corkum.
Journal of Physical Oceanography, Vol. 6, No. 2, p 125-129, March 1976. 12 fig, 2 tab, 12 ref. DOD F44620-72-C-0040.

Descriptors: *Air temperature, *Water temperature, *Atlantic Ocean, Europe, Temperature, Atmospheric pressure, Climatology, Oceans, Oceanography.
Identifiers: *Mediterranean Sea, *Greenland, *Thermal lag, Climatic change.

An analysis was made of (1) the annual sea-surface temperature in the Northern Atlantic; (2) the sea temperatures (0-200 m) along 33 deg 00 min E between 70 deg 30 min and 72 deg 30 min N (Kola Section) representative of the inflow of relatively warm North Atlantic water into the Barents Sea; and (3) the annual air temperatures and pressures over the northern North Atlantic, Greenland, and Europe to determine whether the ocean lags (behind) the atmosphere during a climatic change by comparing the 1951-60 decade with the preceding 1941-50 decade, and with the 1921-50 period as a whole; and the 1961-70 decade with the preceding 1951-60 decade. The results obtained showed a

decline in the air temperature with no change in the sea-surface temperature in the 1951-60 decade from the preceding 1941-50 decade, and a rise in sea-surface temperature in the 1951-60 decade over the 1921-50 period suggesting a lag in the ocean vis-a-vis the atmosphere. The results further showed a decrease in both the sea and air temperatures in 1961-70, yet with some of the areas continuing to show either an increase or no change in sea-surface temperatures as evidence of a continuing lag behind the air temperature. An analysis of the air and sea-surface temperatures of the western Mediterranean (a much smaller body of water and therefore likely to respond more quickly to a climatic change) showed a rise in both the air and sea-surface temperatures in 1951-60 over 1921-50, the rise in the sea-surface temperature being the greater. (Sims - ISWS)
W76-08127

EKMAN VEERING OBSERVED NEAR THE OCEAN BOTTOM,
Oregon State Univ., Corvallis. School of Oceanography.
P. K. Kundu.
Journal of Physical Oceanography, Vol. 6, No. 2, p 238-242, March 1976. 4 fig, 1 tab, 14 ref. NSF ID 071-0411.

Descriptors: *Ocean currents, *Coasts, *Oregon, *Pacific Ocean, Shores, Ocean circulation, Winds, Current meters, Measurement, Analytical techniques, Oceanography.
Identifiers: *Ekman veering.

It has been shown that the phase angle of the complex correlation coefficient is a good measure of the average relative angular displacement (veering) between a pair of two-dimensional vector series. The correlation coefficient between the low-frequency (omega less than 0.6 cpd) components of the current vectors at 20 m and 5 m heights from the ocean bottom at a station near the Oregon coast reveals an Ekman veering of 6 degrees. (Sims - ISWS)
W76-08129

THE BALTIC SEA--A SEMI-ENCLOSED SEA, AS SEEN BY THE HYDROLOGIST,
Swedish Natural Science Research Council, Stockholm.
M. Falkenmark, and Z. Mikulski.
Nordic Hydrology, Vol. 6, No. 3, p 115-136, 1975. 10 fig, 4 tab, 28 ref.

Descriptors: *Sea water, *Basins, *Hydrology, *Water balance, *Ecology, Freshwater, Oceanography, Pollutants, Meteorology.
Identifiers: *Baltic Sea, *Renewal, *Scandinavia, Water exchange, Oceanographers, Depth profile, Vertical water balance, Horizontal water balance.

The water renewal of the Baltic Sea, a semi-enclosed basin, was discussed from the general configuration of the water balance, the size and distribution of the individual elements, and the interrelations between them. Connections between long-term variations in the water balance and certain ecological features were stressed. International cooperation has been organized between the seven riparian countries to make possible a deepened understanding of the water renewal. Monthly data are being collected for the period 1951-1975, the responsibility for individual elements being distributed among the participating countries. (Roberts - ISWS)
W76-08130

SHOOTING MODELS FOR SALINITY AND COLIFORM,
Texas Univ. at Austin. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5B.
W76-08134

TWO-DIMENSIONAL MATHEMATICAL WATER QUALITY MODEL,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-08135

SUSPENDED MATERIAL TRANSPORT: NARRAGANSETT BAY AREA, RHODE ISLAND,
Rhode Island Univ., Kingston, Graduate School of Oceanography.
B. P. Collins.
Estuarine and Coastal Marine Science, Vol. 4, No. 1, p 33-44, January 1976. 5 fig, 1 tab, 22 ref, 1 append.

Descriptors: *Sediment transport, *Suspended load, *Circulation, *Rhode Island, Suspended solids, Estuaries, Coasts, Silts, Bays, Currents(Water), Water circulation, Particle size, On-site investigations.
Identifiers: *Circulation pattern, *Narragansett Bay(RI), Sea-bed drifters, Particle size distribution, Coastal currents.

Net circulation patterns and routes of suspended material transport in lower Narragansett Bay and its approaches were investigated utilizing sea-bed drifters, transmissometer measurements, grain size distributions, suspended material concentration data and compositional analyses. In general, seaward flowing near-surface currents carry silt through lower West and East Passages, west across the Bay mouths and then south along Point Judith Neck. Very fine silt is carried along this route with little deposition but medium silt settles toward the Bay mouths. At the entrances to Narragansett Bay, the landward-flowing direction of bottom currents is modified by coastal currents and topographic influences. Near-bottom suspended material is carried into all three Narragansett Bay passages as well as eastward and westward across the entrances. The westward setting component transports suspended matter from East and West Passage across the passage mouths, southward adjacent to Point Judith Neck and then westward into Block Island Sound. Coarse silt suspended by turbulence at East and West Passage mouths is deposited along this path in the sandy silt bed (McMaster, 1960), east of Point Judith Neck. Some of the very fine silt carried along this route may be deposited in the sandy silt bed as well as in Block Island Sound. The eastward component, influenced by the nearshore circulation in Buzzards Bay, flows along the southeastern Massachusetts coast. (Lee-ISWS)
W76-08139

THE THEORY AND APPLICATIONS OF OCEAN WAVE MEASURING SYSTEMS AT AND BELOW THE SEA SURFACE, ON THE LAND, FROM AIRCRAFT, AND FROM SPACECRAFT,
City Univ. of New York. Inst. of Oceanography.
For primary bibliographic entry see Field 7B.
W76-08145

STUDIES ON THE ANIMAL COMMUNITIES IN TWO NORTH FLORIDA SALT MARSHES. PART I. FISH COMMUNITIES,
Florida Agricultural and Mechanical Univ., Tallahassee.
C. B. Subrahmanyam, and S. H. Drake.
Bulletin of Marine Science, Vol. 25, No. 4, p. 445-465, 1975. 8 fig., 7 tab., 40 ref. USDA 216-15-03.

Descriptors: *Fish populations, *Temporal distribution, *Tidal marshes, Florida, Water temperature, Salinity, Biomass, Dominant organisms, Tributaries, Varieties, Killifishes, Tides, Juvenile fish.
Identifiers: Diversity index, St. Marks Marsh(Fla), Wakulla Marsh(Fla), Cyprinodontiform fish.

The St. Marks and Wakulla marshes, Florida, are undisturbed Juncus tidal marshes. Diversity indices calculated from seasonal fluctuations in temperature, salinity, abundance, and fish biomass in tidal creeks in each locality were used to interpret temporal changes in fish community composition. The creeks' salinities ranged from 3.9-27. 8‰ and temperatures 12-36C. Fifty-five fish species were caught, but seven cyprinodontiform species, Menidia beryllina, Leiostomus xanthurus, Eucinostomus argenteus, and Anchoa mitchilli were dominant. Community compositions varied with tides. The designation 'Fundulus-Menidia' community, was proposed for north Florida marsh fish populations. Abundances and biomass were greater at low tide but could not be correlated with seasonal temperatures or salinities. Temperature was negatively correlated with L. xanthurus abundance and positively with cyprinodontiform species. Salinity was positively correlated with L. xanthurus and Lagodon rhomboides. Gut contents, occurrence at low or high tides, and monthly length frequencies were used to group fish into permanent residents or species, using the marshes for nurseries, foragers, or visitors. Most species were represented by juveniles whose seasonal successions were observed. The diversity index increased with warmer temperatures and was influenced by species richness and distribution. The tidal creeks showed low species similarity in relation to tides and seasons at St. Marks and greater similarity at Wakulla. (Buchanan-Davidson--Wisconsin)
W76-08161

SESSILE ANIMALS ON TAR GLOBULES IN THE WATERS AROUND THE RYUKYU ISLANDS, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
T. U. Y. Kajihara, and M. Tachibana.
J Oceanogr Soc Jpn. 31(3); p 131-135, 1975.

Descriptors: Sessile algae, Tubificids, Worms, Aquatic animals, Pacific Ocean, Islands, Specific gravity.
Identifiers: Janua-Foraminosa, Lepas-Anatifera, Lepas-Pectinata, *Bryozoans, *Tubeworms, *Goose barnacles, Tar globules, *Japan(Ryuku Islands).

A large number of tar globules with sessile organisms were collected from the surface tows taken with larval nets in the waters around the Ryukyu Islands (Japan) during Nov. and Dec. 1973. Bryozoans (1 sp.), tubeworms (Serpulidae, Janua (Dexiospira) foraminosa (Moore et Bush) and goose barnacles (Lepas pectinata Spengler, L. anatifera were the most important species. Sinking of tar globules by Lepas of middle or large size was suggested from the differences in their specific gravity.--Copyright 1976, Biological Abstracts, Inc.
W76-08232

DISTRIBUTION OF CHAETOGNATHA AND BIOMASS OF THE ZOOPLANKTON IN THE WESTERN PART OF THE TROPICAL ATLANTIC, DURING JULY AND AUGUST 1968, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
L. J. Urosa, and T. S. S. Rao.
Bol Inst Oceanogr Univ Oriente Cumana. 13(1/2), p 53-66, 1974.

Descriptors: *Zooplankton, *Biomass, *Atlantic Ocean, South America, Coasts, *Distribution patterns, Seasonal, Trophical regions, Salinity, Temperature.
Identifiers: *Chaetognatha, Krohnitta-Pacifica, Pterosagitta-Draco, Sagitta-Decipiens, Sagitta-Enflata, Sagitta-Helenae, Sagitta-Hispida, Sagitta-Hexaptera, Sagitta-Minima, Sagitta-Serratodentata, Sagitta-Tenuis.

The western tropical Atlantic Ocean off the northern coast of South America is greatly influenced by the outflow of the Amazon and Orinoco Rivers, and others. The Guiana Current interacts with the freshwater outflow and brings about marked changes in the salinity and temperature conditions over the area. This results in seasonal faunistic changes. Surface plankton collections were made at 90 stations during July-Aug. 1968, on board M/N LA SALLE, using a net made of Number3 nylon--mesh .324 mm-with a mouth diameter of 50 cm. Each collection took 10 min duration and filtered approximately 45 m3 of water. The following species of chaetognaths were recorded from the area: Sagitta enflata Grassi 1881; S. serratodentata Krohn 1853; S. hispida Conant 1895; S. helenae Ritter-Zahony 1910; S. decipiens Fowler 1905; S. hexapera d'Orbigny 1834; S, minima Grassi 1881; S. tenuis Conant 1896; Krohnitta pacifica (Aida) 1897 and Pterosagitta draco (Krohn) 1853. The results obtained during July-Aug. are compared with similar work done in this area by Alvarino (1968) and Calef and Grice (1967) during Oct.-Nov. and May-June. The 4 dominant species during July-Aug. were S. enflata, S. hispida, S. serratodentata and K. pacifica. The others show irregular distribution. Zooplankton biomass-wet displacement volume-during July-Aug. showed twice the value reported by Calef and Grice (1967) for spring in the area.--Copyright 1976, Biological Abstracts, Inc.
W76-08245

ECOLOGY OF THE ZOOPLANKTON IN THE GULF OF CARIACO. PART I: VARIABILITY OF THE BIOMASS OF THE ZOOPLANKTON DURING THE PERIOD FROM AUGUST TO NOVEMBER, 1973, (IN SPANISH),
Indian Ocean Biological Centre, Cochin (India); and National Inst. of Oceanography, Cochin (India).
For primary bibliographic entry see Field 5C.
W76-08247

RESEARCH STUDIES ON THE FAUNA OF THE GREEK SUBTERRANEAN WATERS, (IN FRENCH),
C. Bou.
Biol Gallo-Hell. 6(1), p 101-115, 1975.

Descriptors: *Copepods, *Isopods, *Amphipoda, Marine animals, Groundwater, *Subsurface waters, Europe, Caves, Karst hydrology, Coasts.
Identifiers: Balcanella-petkovskii, Balcanella-vandeli, Bogidiella-longiflagellum, Bogidiella-sp., Eriopisa-sp., Graeteriella-sp., Microcharon-major, Microcharon-stygius, Microparasellus-sp., Niphargus-jovanovici, Niphargus-longicaudatus, Niphargus-skopljensis, Nitocrella-sp., Pseudocandona-spelea, Salentinella-angelieri, Sigmatidium-sp., Speocyclops-sp., *Ostrocods, *Greece.

About 40 samples, obtained in summer 1969 and 1971 in underground waters of Greece (Euboea, Peloponnesus, Cephalonia and Ionia), show an interesting underground fauna living in water sheets, rivers and in caves and karstic springs. The copepods (Speo-cyclops sp., Graeteriella sp., Nitocrella sp. and Sigmatidium sp.), ostracods (Pseudocandona aff. spelea), Isopods (Microcharon stygius, M. major, Microparasellus sp.) and Amphipods (Balcanella petkovskii, B. vandeli, Salentinella angelieri, Bogidiella longiflagellum, Bogidiella sp., Eriopisa sp., Niphargus skopljensis, N. jovanovici and N. longicaudatus).--Copyright 1976, Biological Abstracts, Inc.
W76-08296

A STUDY ON MARINE TRACE ELEMENTS AND CSK STANDARDS, (IN JAPANESE),
Sagami Chemical Research Center, Sagamihara (Japan).
K. Sugawara.
J Oceanogr Soc Jpn. 30(6), p 304-311, 1974.

Descriptors: *Trace elements, *Standards, Oceans, Sea water, Copper, Zinc, Nutrients, Pacific Ocean, Vanadium, Antimony, Arsenic, Molybedenum, *Pollutant identification.
Identifiers: CSK standards, *Japan.

Studies on trace elements in oceans are reviewed. Cu, Zn, V, Sr, As and Mo levels in seawater are compared with those of freshwater and earth materials. CSK (Cooperative Study of the Kuroshio (Japan)) standards for trace elements and other nutrients of oceans are compared with the findings of similar organizations.--Copyright 1976, Biological Abstracts, Inc.
W76-08311

PLANKTONIC ECOSYSTEMS: THE EFFECTS OF DYSTROPHIC CONDITIONS ON STRUCTURE AND FUNCTION IN THE GULF OF FOS, (IN FRENCH),
Aix-Marseille-Univ. (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 5C.
W76-08312

ORGANIC CARBON, PHOSPHORUS AND NITROGEN IN THE WATERS OF THE SEA OF JAPAN, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5A.
W76-08313

FINE-DISPERSED FRACTION OF SUSPENDED ORGANIC MATTER IN THE EAST PACIFIC WATERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Insstitut Okeanologii.
For primary bibliographic entry see Field 5C.
W76-08314

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. VII, A HINDCAST,
New York City-Rand Inst., N.Y.
For primary bibliographic entry see Field 5B.
W76-08317

ERTS-1 INVESTIGATION OF WETLANDS ECOLOGY,
American Univ., Washington, D.C. Dept. of Biology.
R. R. Anderson, V. Carter, and J. McGinness.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-26464, $5.50 in paper copy, $2.25 in microfiche. Final Report. 106 p, 18 fig, 6 tab, 37 ref, 5 append. NASA NAS5-21752.

Descriptors: *Remote sensing, *Wetlands, *Estuaries, *Southeast US, Satellites(Artificial), Aircraft, Aerial photography, Vegetation, Coasts, Marshes, Salt marshes, Bays, Shallow water, Analytical techniques, Data processing, Classification.
Identifiers: *ERTS.

The primary goal of this study was to test the feasibility of using ERTS-1 data to provide information for studies of coastal wetland ecology. The data were analyzed with reference to four major objectives contained in the original proposal. These objectives were as follows: (1) to develop methods for delineation and mapping of wetlands plant communities and for establishment of the boundaries of the wetlands ecosystem; (2) to provide a method for identification and evaluation of wetland types for purposes of coastal zone management including preservation and maintenance of wildlife populations; (3) develop methodology for monitoring coastal wetlands on a regular basis for protection from man-made and natural reduction in productivity; and (4) develop methodology for delineation and mapping of shallow water areas. During the course of the study, the first three objectives were accomplished. The fourth objective, mapping of shallow water areas, was not accomplished because the turbidity of the coastal water in the test site appeared to be too great to pursue this objective within the time allotted. The methods used for analysis of ERTS data, the results of the analysis, and present and potential application of ERTS data to coastal wetlands were discussed. (Sims-ISWS)
W76-08319

UPDATING THE NAVY ENVIRONMENTAL PROTECTION DATA BASE TO INCORPORATE OIL SPILL CLEAN-UP PERFORMANCE,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5B.
W76-08320

GUIDELINES FOR MATERIAL PLACEMENT IN MARSH CREATION,
Center for Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-08325

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY, PART II: NON-CONSERVATIVE SPECIES TRANSPORT MODELS,
Alabama Univ., Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 5B.
W76-08327

DEVELOPMENT OF A THREE-DIMENSIONAL TIME-DEPENDENT FLOW FIELD MODEL,
Louisiana State Univ., Baton Rouge, Dept. of Chemical Engineering.
R. C. Farmer, W. R. Waldrop, F. H. Pitts, and K. R. Shah.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-24070, $5.00 in paper copy, $2.25 in microfiche. Report NASA-CR-120762, January 1975. 88 p, 6 fig, 2 tab, 9 ref, 1 append. NASA NAS8-30380.

Descriptors: *Estuaries, *Bays, *Sediment transport, *Model studies, *Alabama, Mathematical models, Computer models, Computer programs, Flow, Sea water, Freshwater, Saline water-freshwater interfaces, Winds, Rivers, Circulation, Water circulation, Fluid mechanics.
Identifiers: *Mobile Bay(Ala).

A three-dimensional, time-dependent mathematical model to represent Mobile Bay was developed. The objective of this study was to develop computer programs which would numerically solve the appropriate conservation equations for predicting bay and estuary flow fields. The model will be most useful for analyzing the dispersion of sea water into fresh water and the transport of sediment. Also, the model serves as a useful tool for relating field and physical model data. The unique feature of this model is that it correctly accounts for momentum transfer in the governing flows, thereby making it far more realistic than any previously devised. NASA's ERTS and Skylab programs resulted in high quality photographs of Mobile Bay. U.S. Army Corps of Engineers have also studied this bay extensively. All these data have been reviewed for comparison to this mathematical model. The computer program listing is contained in the appendix. (Sims-ISWS)
W76-08328

SOME THREE-DIMENSIONAL CHARACTERISTICS OF LOW-FREQUENCY CURRENT FLUCTUATIONS NEAR THE OREGON COAST,
Oregon State Univ., Corvallis. School of Oceanography.
P. K. Kundu, and J. S. Allen.

Journal of Physical Oceanography, Vol. 6, No. 2, p 181-199, March 1976. 12 fig, 7 tab, 21 ref. NSF GX-28746, GX-33502, ID071-04211.

Descriptors: *Currents(Water), *Coasts, *Oregon, *Pacific Ocean, Upwelling, Shores, Circulation, Ocean circulation, On-site data collections, On-site investigations, Oceans, Oceanography.

An analysis was presented of the low-frequency fluctuations of the currents near the Oregon coast, based on the 1972-1973 measurements from moored current meters in CUE-1 and CUE-2. U and v denoted the eastward (approximately onshore) and northward (approximately alongshore) components of the currents. The mean alongshore velocity has the structure of a baroclinic coastal jet, whose maximum speed occurs near the surface at a distance of about 15-20 km from the shore, whereas the fluctuating part of v has the structure of a roughly barotropic coastal jet whose maximum occurs very near the shore. The standard deviation of v is approximately depth-independent whereas that of u decreases with depth. As one approaches the coast, the standard deviation of u decreases whereas that of v rises steeply, consistent with the behavior expected of coastally trapped wave motion. A scatter plot of the velocity fluctuations in a hodograph plane indicates that the fluctuations roughly follow the direction of the local isobaths. The Reynolds stresses in an east-north coordinate system therefore change sign because of the change of direction of the isobaths in the region. The v fluctuations seem to be mutually better correlated than the u fluctuations throughout the region, suggesting that the u components may be affected by 'turbulence'. (Sims-ISWS)
W76-08336

A PARAMETRIC WAVE PREDICTION MODEL,
Max-Planck-Institut fuer Meteorologie, Hamburg (West Germany).
K. Hasselmann, D. B. Ross, P. Muller, and W. Sell.
Journal of Physical Oceanography, Vol. 6, No. 2, p 200-228, March 1976. 12 fig, 1 tab, 48 ref.

Descriptors: *Model studies, *Mathematical models, *Ocean waves, *Waves(Water), Numerical analysis, Equations, Computer models, Forecasting, Energy, Energy transfer, Oceanography.
Identifiers: *Wave spectra.

Measurements of fetch-limited wave spectra from various sources indicate an approximate invariance of the normalized spectral shape with fetch. It has been suggested from investigations of the spectral energy balance that this can be explained by the shape-stabilizing influence of nonlinear resonant wave-wave interactions, which are also responsible for the migration of the spectral peak to lower frequencies. Analyses of a series of further data sets obtained under non-uniform, non-stationary wind conditions show that the invariance of the spectral shape is not restricted to uniform-wind, fetch-limited situations, but applies generally for a growing wind sea. The observed shape invariance was exploited in a wave prediction model by projecting the full transport equation for the two-dimensional spectral continuum onto two variables characterizing the energy and frequency scales of the spectrum. Inspection of the resultant equations revealed further simplifications, enabling the system to be reduced to a single prediction equation for one scale variable, the peak frequency. This was feasible because of the rapid adjustment of the spectrum to a quasi-equilibrium level in which the atmospheric input is balanced by the nonlinear transfer of energy out of the central region of the spectrum to higher and lower frequencies. (Sims-ISWS)
W76-08337

NUMERICAL COMPUTATION OF TWO-DIMENSIONAL FLOWS,
Lanchester Polytechnic, Coventry (England), Dept. of Civil Engineering.
J. P. Grubert.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW1, Proceedings Paper 11891, p 1-12, February 1976. 6 fig, 9 ref, 2 append.

Descriptors: *Coastal engineering, *Estuaries, *Harbors, *Waves(Water), *Analytical techniques, Model studies, Hydraulics, Tsunamis, Seiches, Tides.
Identifiers: *Hooghly estuary(India), *Courant number, Implicit finite difference scheme.

A computational system was presented for the calculation of long waves in harbors and coastal seas. The numerical method used was a three-level implicit finite difference scheme, using the fractional steps technique. The method is as accurate as existing explicit schemes, but the implicit scheme improves in performance as the wave period increases. Computations on the Hooghly estuary have shown that the scheme is not only accurate but can be at least five times cheaper than an equivalent explicit scheme. The system has been tested with waves of a few minutes period under storm conditions. Tests on harbor under gale conditions with waves of one minute period showed that nonlinear instabilities develop, but they can be dissipated by iterating for equation coefficients. (Singh - ISWS)
W76-08341

OREGON COAST SHORELINE CHANGES DUE TO JETTIES,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 8B.
W76-08342

HYDROGEOLOGY OF THE SOUTH FORK OF LONG ISLAND, NEW YORK,
Wisconsin Univ. Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W76-08347

A SEABED DRIFTER STUDY OF NEAR-BOTTOM CIRCULATION IN NORTH CAROLINA SHELF WATERS,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
J. D. Schumacher, and B. J. Korgen.
Estuarine and Coastal Marine Science, Vol. 4, No. 2, p 207-214, March 1976. 3 fig, 1 tab, 20 ref.

Descriptors: *Drifting(Aquatic), *Estuaries, *Continental shelf, *Water circulation, *North Carolina, Coasts, On-site investigations, Circulation, Ocean circulation, Currents(Water), Inlets(Waterways), Oceanography.
Identifiers: *Seabed drifters, Raleigh Bay(NC), Onslow Bay(NC), Near-bottom currents.

Circulation within North Carolina near-bottom shelf waters was investigated between June 1972 and April 1973 using seabed drifters (SBDs). Seabed drifter trajectories revealed a tendency for onshore components of near-bottom drift in Raleigh Bay; in Onslow Bay near-bottom currents were complex, generally featuring offshore components in the northern end with a tendency for onshore components in the southern end. A divergence zone separating onshore from offshore near-bottom flow was found in Onslow Bay. The location of this zone remained constant during the duration of the study. (Sims - ISWS)
W76-08350

CHLORINATED PESTICIDES AND POLYCHLORINATED BIPHENYLS IN MARINE SPECIES, OREGON/WASHINGTON COAST, 1972,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 5A.
W76-08359

ROLE OF VITAMINS IN BACTERIAL-PLANKTON RELATIONSHIPS IN LITTORAL SEAWATER AND IN SUPRALITTORAL POOLS: II. ANNUAL EVOLUTION OF ORGANISMS WHICH PRODUCE VITAMIN SYNTHESIS, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5C.
W76-08405

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W76-08411

CULTURE AND GROWTH OF NORTHERN ANCHOVY, ENGRAULIS MORDAX LARVAE,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
J. R. Hunter.
Fishery Bulletin, Vol. 74, No. 1, p 81-88, 1976. 5 fig, 5 tab, 18 ref.

Descriptors: *Fish Physiology, *Aquaculture, Laboratory tests, *Growth rates, *Food chains, *Larval growth stage, *Fish food organisms, Dino-flagellates, Algae, Rotifers, Aquatic microorganisms, Brine shrimp, Copepods, Methodology, Growth stages, Immature growth stage, Mortality, Fish diets, Plankton, Water pollution effects.
Identifiers: Starvation, *Northern Anchovy, Engraulis mordax, Metamorphosis.

Culture techniques used to rear larval anchovy through metamorphosis using laboratory cultured foods are described. Anchovy larvae fed dinoflagellates, rotifers, harpacticoid copepods, and brine shrimp nauplii, completed metamorphosis (35 mm) in 74 days at 16C with a minimum survival of 12.5%. Growth in length and weight were recorded over this interval which correlated with the Laird-Gompertz growth equation. Growth was comparable to that on a wild plankton diet. Most of the fish that completed metamorphosis withstood a starvation period of 12-15 days, whereas those that had not completed metamorphosis did not survive. (Katz)
W76-08432

CHLORINATED HYDROCARBONS IN MESOPELAGIC FISHES OF THE EASTERN GULF OF MEXICO,
University of South Florida, St. Petersburg, Fla.
For primary bibliographic entry see Field 5C.
W76-08434

ABUNDANCE OF MACROCRUSTACEANS IN A NATURAL MARSH AND A MARSH ALTERED BY DREDGING, BULKHEADING, AND FILLING,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08435

DDT AND ITS METABOLITES IN THE SEDIMENTS OFF SOUTHERN CALIFORNIA,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08436

EFFECTS OF TEMPERATURE AND SALINITY ON THE SURVIVAL OF WINTER FLOUNDER EMBRYOS,
National Marine Fisheries Service, Narragansett, R. I. Narragansett Lab.
For primary bibliographic entry see Field 5C.
W76-08437

EFFECTS OF LOW CONCENTRATIONS OF OIL ACCOMMODATED IN SEA WATER ON THE GROWTH OF UNIALGAL MARINE PHYTOPLANKTON CULTURES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W76-08440

MORTALITIES AND EPIBIOTIC FOULING OF EGGS FROM WILD POPULATIONS OF THE DUNGENESS CRAB, CANCER MAGISTER,
California Univ., Davis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5C.
W76-08444

THE PLANKTON TOWER. I. A STRUCTURE TO STUDY WATER/SEDIMENT INTERACTIONS IN ENCLOSED WATER COLUMNS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W76-08446

THE PLANKTON TOWER. II. RELEASE OF NUTRIENTS FROM SEDIMENTS DUE TO CHANGES IN THE DENSITY OF BOTTOM WATER,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W76-08447

THE EFFECT OF HEAVY METALS ON LABORATORY POPULATIONS OF TWO POLYCHAETES WITH COMPARISONS TO THE WATER QUALITY CONDITIONS AND STANDARDS IN SOUTHERN CALIFORNIA MARINE WATERS,
California State Univ., Long Beach.
For primary bibliographic entry see Field 5C.
W76-08451

THERMAL-HYDRAULIC MODEL STUDY OF OFFSHORE DISCHARGE SYSTEM FOR KAHE POWER PLANT, HAWAII,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-08508

ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W76-08510

THE ROLE OF ORGANIC DETRITUS IN THE FORMATION OF DISTINCTIVE SANDY TIDAL FLAT SEDIMENTARY STRUCTURES, TAY ESTUARY, SCOTLAND,
Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center.
A. T. Buller, and C. D. Green.
Estuarine and Coastal Marine Science, Vol. 4, No. 2, p 115-118, March 1976. 1 fig, 3 plates, 8 ref.

Descriptors: *Estuaries, *Sediments, *Detritus, *Organic matter, Decomposing organic matter, Organic compounds, Sands, Peat, Deposition(Sediments), Tides, Tidal waters, Tidal effects, Sedimentology.
Identifiers: *Tay Estuary(Scotland), *Scotland.

The intermittent deposition, subsequent burial and decomposition of organic detritus along part of the Tay estuary's lower sandy tidal flats produce black peatysand layers which crudely resemble sedimentary structures typical of mixed tidal flats. Erosion of some of these peaty layers by lateral creek migration results in the formation of peaty-sand clasts. These are organic-rich equivalents of mud clasts normally found as mud pebbles and conglomerates deposited on the bottoms of mixed tidal flat creeks. (Sims-ISWS)
W76-08524

OCEANOGRAPHIC CONDITIONS DURING 1973 IN RUSSEL FJORD, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
W. S. Reeburgh, R. D. Muench, and R. T. Cooney.
Estuarine and Coastal Marine Science, Vol. 4, No. 2, p 129-145, March 1976. 11 fig, 2 tab, 17 ref.

Descriptors: *Fjords, *Glaciers, *Water circulation, *Alaska, On-site data collections, On-site investigations, Estuaries, Coasts, Sampling, Temperature, Salinity, Oxygen, Nutrients, Bathymetry, Oceanography.
Identifiers: *Glacial damming, Russell Fjord(Alaska), Hubbard Glacier(Alaska).

Russell Fjord appears to be in the process of being dammed and isolated from marine influence by the advancing Hubbard Glacier. This study was initiated to understand the present circulation of the fjord and to provide a basis for comparison in the event that closure should occur. Observations made during 1973 indicated that the deep water is continuously renewed by near-surface source water added over the sill. 'N0', 9 N03(-) plus 02, appears to be useful in tracing these additions. The probable consequence of glacial damming were considered. (Sims-ISWS)
W76-08525

DISTRIBUTION AND MOVEMENT OF ZINC AND OTHER HEAVY METALS IN SOUTH SAN FRANCISCO BAY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-08561

PLUTONIUM IN THE AQUATIC ENVIRONMENT, ITS BEHAVIOUR, DISTRIBUTION AND SIGNIFICANCE,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5C.
W76-08599

PLUTONIUM IN ATLANTIC COASTAL ESTUARIES IN THE SOUTHEASTERN UNITED STATES OF AMERICA,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5C.
W76-08600

COMPARISON OF THE DISTRIBUTIONS IN MARINE SEDIMENTS OF THE FALLOUT DERIVED NUCLIDES FE 55 AND PU 239,240, A NEW APPROACH TO THE CHEMISTRY OF ENVIRONMENTAL RADIONUCLIDES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-08603

ENVIRONMENTAL AND PUBLIC HEALTH CONSEQUENCES OF THE CONTROLLED DISPOSAL OF TRANSURANIC ELEMENTS TO THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5C.
W76-08604

REFERENCE METHODS FOR MARINE RADIOACTIVITY STUDIES II.
International Lab. of Marine Radioactivity, Vienna (Austria).
For primary bibliographic entry see Field 5A.
W76-08608

PHYTOPLANKTON ENTRAINMENT STUDIES AT THE INDIAN RIVER ESTUARY, DELAWARE,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 5C.
W76-08636

ENTRAINMENT STUDIES AT TURKEY POINT ON BISCAYNE BAY: HAVE THERMAL EFFECTS AFFECTED THE PLANKTON OF BISCAYNE BAY,
Air and Water Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5C.
W76-08645

LABORATORY SIMULATION OF POWER PLANT EFFECTS: RESPONSE OF SOME ESTUARINE PHYTOPLANKTERS TO TIME TEMPERATURE COMBINATIONS,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5C.
W76-08646

CHLORINATED HYDROCARBON PESTICIDES AND MERCURY IN COASTAL BIOTA, PUERTO RICO AND THE U.S. VIRGIN ISLANDS--1972-74,
Georgia Univ., Brunswick. Marine Resources Extension Center.
For primary bibliographic entry see Field 5B.
W76-08683

FIELD PERFORMANCE OF PERMEABLE BREAKWATER,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 8A.
W76-08684

SEASONAL STUDIES ON THE RELATIVE IMPORTANCE OF DIFFERENT SIZE FRACTIONS OF PHYTOPLANKTON IN NARRAGANSETT BAY (USA),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W76-08686

MICROBIAL ATP AND ORGANIC CARBON IN SEDIMENTS OF THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08687

DETRITUS PRODUCTION IN COASTAL GEORGIA SALT MARSHES,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5C.
W76-08688

PHOSPHORUS FLUX AND CYCLING IN ESTUARIES,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
For primary bibliographic entry see Field 5C.
W76-08689

CAUSES AND PROBABLY CORRECTIVES FOR OXYGEN DEPLETION FISH KILLS IN THE DICKINSON BAYOU ESTUARY: A FIELD STUDY AND SIMPLIFIED ALGAL ASSAY,
Texas Parks and Wildlife Dept., Seabrook. Seabrook Marine Lab.
For primary bibliographic entry see Field 5C.
W76-08690

NITROGEN UTILIZATION DURING SPRING BLOOMS OF MARINE PHYTOPLANKTON IN BEDFORD BASIN, NOVA SCOTIA, CANADA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-08691

ENERGY TRANSFER IN SEDIMENTARY ENVIRONMENTS: THE CASE OF SULFATOREDUCERS: I. THE ORGANIC ACIDS IN LAGOON AND MARINE SEDIMENTS (GOLFE DU LION), (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
For primary bibliographic entry see Field 5C.
W76-08718

A PHYSICAL MODEL FOR THE RATE OF DEPOSITION OF FINE-GRAINED SEDIMENTS IN THE DEEP SEA,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2J.
W76-08736

DISTRIBUTION, COMPOSITION, AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE VICINITY OF WILLAPA SUBMARINE CANYON, WASHINGTON,
Washington Univ., Seattle. Dept. of Oceanography.
E. T. Baker.
Geological Society of America Bulletin, Vol. 87, No. 4, p 625-632, April 1976. 7 fig, 2 tab, 46 ref. NSF 30537; ERDA AT 45-1-2225 TA 24.

Descriptors: *Sediment distribution, *Suspended solids, *Continental slope, *Sedimentation, *Washington, *Columbia River, Submarine canyons, Continental shelf, Sediment transport, Chemical analysis, Turbidity, Turbidity currents, Turbulent boundary layers, Measurement, Oceans, Rivers, Sedimentology.
Identifiers: *Willapa Canyon(Wash), Nepheloid layers, Light-scattering measurements.

The distribution and composition of suspended particulate matter in the waters over Willapa submarine canyon and the adjacent continental slope off the coast of Washington describe an apparently continuous bottom nepheloid layer ranging in thickness from 160 to 530 m and composed of particles supplied primarily by the nearby Columbia River. Near-bottom particulate concentrations, estimated by continuous vertical profiles of light-scattering intensity, systematically decrease from the continental shelf to the base of the slope. Within this trend, concentrations in Willapa Canyon are greater by a factor of as much as 3 than concentrations present at comparable locations on the adjacent open-slope areas. Mineralogical analysis of the suspended sediment within the bottom nepheloid layer suggests that the increased concentrations found within Willapa Canyon result from a preferential accumulation of Columbia River-derived particles relative to the surrounding open-slope areas. Montmorillonite/chlorite ratios greater than 1 characterize the Columbia River suspended load, and this ratio remains greater than 0.7 in samples from upper Willapa Canyon while decreasing to less than 0.7 in samples from the surrounding open slope and lower Willapa Canyon. The excess density provided by the intense nepheloid layer found in Willapa Canyon may be influential in generating a net downcanyon component of bottom flow such as observed in other submarine canyons. Predicted rates of net basinward transport of the bottom nepheloid layer sediments were in good agreement with long-term current measurements in other canyons. (Sims - ISWS)
W76-08737

ONE-DIMENSIONAL TEMPERATURE PREDICTIONS IN UNSTEADY FLOWS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-08738

COMPUTATION OF TIDAL FLOW IN WELL-MIXED ESTUARIES,
Washington Univ., Seattle. Dept. of Aeronautics; and Washington Univ., Seattle. Dept. of Mathematics.
C. E. Pearson, and D. F. Winter.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11990, p 367-377, March 1976. 5 fig, 11 ref, 2 append. EPA R801320.

Descriptors: *Model studies, *Tidal waters, *Estuaries, Flow, Channel flow, Channels, Fjords, Currents(Water), *Tides, Inlets(Waterways), Fourier analysis, Numerical analysis, Rivers, Hydraulics, Oceanography, Mixing.
Identifiers: *Well-mixed estuaries.

A new efficient procedure was developed for computing periodic flow in well-mixed estuaries of arbitrary geometry. A harmonic analysis was performed in which accurate representations of the nonlinear terms in the equations of motion are developed by successive approximation. At each iteration, the modal coefficients satisfy a system of first-order equations and boundary conditions which were combined in such a way as to promote algorithmic efficiency. The method was illustrated by applications to a model river estuary and to a deep inlet with a sill. Accuracy was demonstrated for the former case (where nonlinear effects are strong) by close agreement with results obtained from a time-stepping method. The method appears to be very efficient, and computation time may be less than 10% of that required by conventional time-stepping procedures. Analysis of multiple branches and networks of estuaries was also considered. (Sims-ISWS)
W76-08741

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

CONTINUED EVALUATION OF IN-SITU-FORMED CONDENSATION POLYMERS FOR REVERSE OSMOSIS MEMBRANES,
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
J. E. Cadotte, K. E. Cobian, R. H. Forester, and R. J. Peterson.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 193, $5.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/40, April 1976. 80 p, 13 fig, 21 tab, 21 ref.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, *Porosity, Polymers, Extrusion, Sea water, Absorption.
Identifiers: *Polymer membranes, NS 100, NS 200, Aromatic-polyesters, Polyacrolein membranes, Gantrez-sorbitol membranes, *Aromatic polyester membranes, Organic rejection, Water absorption, Porous supports.

A research program was carried out on in situ-formed condensation membranes for seawater desalination that involved three parts: (1) new, exploratory membrane development, (2) further characterization studies on a previously reported membrane, NS-200, and (3) refinement of an underwater extrusion process for microporous polysulfone sheeting. Among new membrane compositions investigated were m-phenylenediamine/formaldehyde, polyacrolein-based systems, crosslinked vinyl and acrylic copolymers, poly (piperazine isophthalamide), phenolic and aromatic polyester membranes, and poly (isophthaloyl oxalamidrazone) membranes. The phenylenediamine/formaldehyde membrane, in particular, exhibited up to 44 gfd at 97 to 98.7 percent salt rejection, when tested against synthetic seawater at 1500 psig. Characterization studies on the NS-200 membrane system covered SEM microscopy, chemistry, elemental analysis, organics rejection, and resistance to biological degradation. A process for underwater extrusion of flat, microporous polysulfone sheeting was developed to the point of fabrication of 25-inch-wide material that was suitable for NS-200 fabrication. (OWRT)
W76-08116

RESEARCH ON ULTRAFILTRATION SYSTEMS UNDER SEAWATER DESALTING CONDITIONS,
Oxy Metal Industries (Intra) Inc., Santa Ana, Calif. Systems Engineering Div.
R. H. Williams, H. A. Parker-Jones, J. V. Peck, and J. L. Richardson.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 210, $5.50 in paper copy, $2.25 in microfiche. Report OWRT/S--76/41, (1976). 107 p, 4 fig, 16 tab, 7 ref, 2 append. 14-30-3295.

Descriptors: *Desalination, *Reverse osmosis, *Filtration, Sea water, *Membranes, *Pretreatment(Water), *Filters, Waste water treatment.
Identifiers: Tubular ultrafilters, Sand filters, Chlorine injection, Fouling, Colloidal silica, Membrane casting, Membrane cleaning, Polysulfone, Braided fiber glass tubes, *Ultrafiltration.

The overall technical objective of this program was to study, optimize, and evaluate tubular ultrafiltration systems under seawater desalting conditions. An experimental investigation was made of the feasibility, both technical and economic, of using tubular ultrafiltration membranes for treating seawater prior to desalination by reverse osmosis. Seawater desalination processes employing reverse osmosis membranes demand extensive pretreatment to prevent surface fouling. The common fouling materials present in seawater, such as biological organisms, colloidal silica, and organics, are difficult and costly to remove reliably with conventional clarification-filtration methods. This study demonstrated the ultrafiltration process to be a promising alternative method of pretreatment, both in terms of reliability and total operating costs. (OWRT)
W76-08117

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 1-5 MGD PLANTS, PLANTS FOR HIGH PRODUCT RECOVERY,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.

P. J. Schroeder, C. G. DeHaven, and M. E. Marwede.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 246, $9.75 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/38, October 1972. 233 p, 69 fig, 45 tab. 14-30-2802

Descriptors: *Desalination, Desalination processes, *Membrane processes, *Reverse osmosis, Brackish water, *Desalination plants, *Engineers estimates, Capital costs, Operating costs.
Identifiers: High product water recovery, Water pretreatment, Cost estimates.

A parametric engineering and economic analysis of the reverse osmosis process was performed in which capital and operating costs, based on 1972 prices, were developed for brackish water plants desalting four different feed waters with salinities of 3648, 1800, 2076 and 3475 ppm. Plants of 1, 3 and 5 MGD capacity, and 60 and 80% product water recovery, using tubular (800 psi), spiral wound (400 psi), hollow fine fiber (600 psi) and hollow fine fiber (250 psi) reverse osmosis module concepts (a total of 96 combinations) were studied. Economics of 1, 3 and 5 MGD multistage, reverse osmosis 95% product water recovery plants for each water type were also determined. (OWRT)
W76-08118

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 3-25 MGD LOW PRESSURE PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
P. J. Schroeder, C. G. DeHaven, and M. E. Marwede.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 247, $7.75 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/37, March 1973. 160 p, 35 fig, 17 tab. 14-30-2802.

Descriptors: *Desalination, Desalination processes, *Membrane processes, *Reverse osmosis, Brackish water, *Desalination plants, *Engineers estimates, Capital costs, Water costs.
Identifiers: Water pretreatment, Cost estimates, Low pressure membranes.

An engineering and economic analysis (based on 1972 prices and technology) of low pressure reverse osmosis brackish water desalting plants employing hollow fine fibers at 100 and 150 psi, and spiral wound modules at 200 and 250 psi was undertaken. Three moderate salinity brackish waters were studied; one at the lowest pressure for each module design at 50% recovery, one with the lowest pressure at 60% recovery, and the third with the highest pressure at 60% recovery. Lower cost plastic components were utilized in the designs to the maximum extent possible. Capital and operating water costs were estimated at 3, 10 and 25 MGD capacity (a total of 18 cases). (OWRT)
W76-08119

SOLID MINERAL AND REGENERANT RECOVERY FOR ION-EXCHANGE RESINS,
Aerojet-General Corp., El Monte, Calif. (Assignee).
D. O. DePree.
U.S. Patent No. 3,941,693, 16 p, 9 fig, 13 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 338, March 2, 1976.

Descriptors: *Patents, Water pollution control, *Water pollution treatment, *Chemical wastes, *Demineralization, *Ion exchange, Industrial wastes, Cation exchange, Anion exchange, Resins, Separation techniques, Waste water treatment.
Identifiers: Deionization, Mineral salts, Regeneration.

A basic spent cation regenerant is combined with an acidic spent anion regenerant to form a weak dissociable complex of the regenerants and to reconstitute the mineral salt. The spent cation and anion regenerants are combined either in a continuous or batch fashion by blending near stoichiometric quantities of the materials. This stoichiometric adjustment is based on the amount of the two streams necessary to reconstitute the mineral salts to be removed from the ion-exchange resins. The regenerant streams may be either aqueous solutions or organic solvent water solutions. In either case, the regenerant streams are diluted by the amount of water of solvation released by the resin during regeneration and possibly by washes of the resin beds. This additional water is removed prior, during or after separation of the regenerants depending on the nature of the separation technique employed. Separation and recovery of the free-base forms of the regenerants may be accomplished by the following: distillation of a more volatile regenerant from a relatively non-volatile regenerant; solvent extraction using an immiscible solvent having preferential solubility for one of the regenerants; or by forming an insoluble complex of one of the regenerants. The recovered regenerants are adjusted in concentration and recycled to regenerate the spent anion and cation resins and the precipitated mineral salts are separated by filtration, sedimentation, or centrifugation. (Sinha - OEIS)
W76-08199

ION-EXCHANGE GROUP BEARING COMPOSITE MEMBRANES,
Kanegafuchi Kagaku Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
S. Imai, T. Eguchi, and M. Shimokawa.
U.S. Patent No. 3,945,927, 6 p, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1908, March 23, 1976.

Descriptors: *Patents, *Waste water treatment, Water quality control, *Separation techniques, *Membrane processes, Desalination processes, Semipermeable membranes, *Ion exchange, Thin films, Coatings, *Membranes.
Identifiers: Composite membranes.

Composite membranes bearing ion-exchange groups suitable for use in membrane separation processes are produced by providing a microporous polymer membrane which is physically semipermeable, and forming a thin layer having ion-exchange groups adjacent the microporous polymer membrane. The microporous polymer membrane used for the substrate of the composite membrane is a selectively permeable film or layer of a film-forming polymer which is itself suitable for use in membrane separations such as ultra-filtration. The substrate membrane must have a number of continuous micropores through which molecules or ions smaller than the pore size can selectively be permeated. The composite membrane may be produced by coating the substrate membrane with a layer of a coating composition comprising a solution or emulsion of a film-forming polymer having reactive sites or groups into which ion-exchange groups can be introduced, removing the solvent or dispersion medium of the coating to provide a ultrathin membrane of the polymer having a thickness less than 10 microns, and introducing the ion-exchange groups into the molecules of the polymer. (Sinha - OEIS)
W76-08211

DEVELOPMENT OF ASSYMMETRIC CELLULOSE TRIACETATE MEMBRANES FOR SEA-WATER DESALINATION,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
J. E. Beckman, R. L. Fox, and S. S. Kremen.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 440, $6.75 in paper copy, $2.25 in microfiche. Research and Technology, Report OWRT/S--76/45, September 30, 1975. 153 p, 43 fig, 52 tab, 1 ref, append. 14-30-3273

Descriptors: *Desalination, Desalination processes, *Reverse osmosis, *Membrane processes, Sea water, *Membranes.
Identifiers: *Cellulose triacetate membranes, Spiral wound modules.

This program represented a continuation of previous work which showed that cellulose triacetate (CTA), with acetyl content in the range of 43% to 44%, should have the required long-term salt rejection capability needed for single stage sea water demineralization. Initially, problems with initial flux and rate of flux decline under reasonable pressure conditions were encountered with the use of CTA. Improvements in membrane fabrication techniques resulted in increased reproducibility which was accompanied by significant increases in membrane compaction resistance and in product flux. At the start of the program, the 10,000 hour flux value at 1000 psig and 30% recovery on sea water was estimated at 3.6 gal/ft2/day (gfd), with a compaction slope (m) equal to -0.17. At the end of the program, the flux value was estimated to be 5.8 gfd and the m value to be approximately -0.08, based on a combination of bench and field installation tests. These resuls demonstrate both the overall improvement in membrane performance and the physical integrity of the spiral elements fabricated for the high pressure application to sea water desalination. (OWRT)
W76-08283

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS SEA WATER DESALTING PLANTS, DESIGN OF 1-10 MGD SEAWATER PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
P. J. Schroeder, C. G. DeHaven, and M. E. Marwede.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 454, $9.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/39, March 1973. 207 p, 20 fig, 25 tab. 14-30-2802.

Descriptors: *Desalination plants, Desalination processes, *Membrane processes, *Reverse osmosis, Sea water, *Engineers estimates, Costs, Capital costs, Water costs.
Identifiers: Sea water pretreatment, Cost estimates.

An engineering and economic analysis of the reverse osmosis process for desalting sea water was performed in which capital and water costs, based on 1972 prices and technology, were developed for single and two-pass plants using hollow fine fiber, spiral wound and tubular modules. Single pass tubular plants were considered at two pressure levels. Costs for each plant were estimated at 1, 5 and 10 MGD capacity (a total of 21 cases). (OWRT)
W76-08284

DENSE EFFLUENT DISPERSION IN A STREAM,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W76-08316

COMMERCIAL MEMBRANE DESALTING PLANTS: DATA AND ANALYSIS,
DSS Engineers, Inc., Ft. Lauderdale, Florida.
C. D. Hornburg, O. J. Morin, Jr., and G. K. Hart.

Available from the National Technical Service, Springfield, Va., 22161 as PB-253 490 $10.75 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/46, September 1975. 335 p, 95 fig, 54 tab. DOI 14-30-3276.

Descriptors: *Desalination plants, *Desalination processes, *Reverse osmosis, *Electrodialysis, Membrane processes, Brackish water, Water treatment, Treatment facilities, *Operating costs, *Operation and maintenance, Virgin Islands, Florida, Wyoming.
Identifiers: Gillette(Wyoming), Siesta Key(Florida), Sanibel Island(Florida), Key Largo(Florida), Rotunda West(Florida), Grand Bahama Island, Sorrento Shores(Florida).

Eleven commercial membrane desalting plants ranging in size from 2500 GPD to 2.0 MGD were surveyed. They included four electrodialysis and seven reverse osmosis plants. Background information is presented covering water demand growth and plant history. Design documentation includes piping diagrams, flowsheets and plant layouts as well as equipment specifications. Emphasis is placed on operating experience and problems including brackish water supply and pretreatment, membrane scaling and fouling, equipment and material failures, and field modifications. Information on six of the larger plants includes performance and production cost analyses over extended operating periods. Specific conclusions are drawn and recommendations made for each plant in report sections 2 through 9. Section 1 summarizes and compares the design and performance of all the plants and contains general conclusions and recommendations. (OWRT)
W76-08370

FIELD EVALUATION TESTING OF REVERSE OSMOSIS HIGH PRESSURE PUMPS AND ENERGY RECOVERY TURBINES.
Catalytic, Inc., Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 532, $6.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/42, April 1973. 133 p, 64 fig, 9 tab. 14-30-3077.

Descriptors: *Desalination, Desalination processes, *Membrane processes, *Reverse osmosis, *Pump testing, *Hydraulic turbines, Centrifugal pumps, Pelton turbines.
Identifiers: Energy recovery, Torque sensors, Roswell, New Mexico, High pressure pump test loops.

Presented are evaluations of one triplex positive displacement pump, one horizontal centrifugal, and one vetical centrifugal pump on brackish water, as well as one horizontal centrifugal pump on simulated sea water at conditions expected to be encountered in reverse osmosis plants. Start-up of the pump test loops and data accumulation began in December 1971. This report covers the period from April 1, 1972 until April 15, 1973 when the pump loops were dismantled. With the exception of the triplex unit, the pumps performed in a satisfactory manner. The triplex horizontal plunger pump had the highest operating efficiency, but the lowest on-stream factor because of failures of the ceramic coated plungers. All pumps were within 3% of the manufacturer's efficiency ratings although none met the published figures. With the exception of the failure of composite parts, the centrifugal pumps performed well. Other problems incurred with the three centrifugal pumps arose mainly from associated equipment and power recovery turbine failures. The power recovery units never met, and rarely approached, their expected efficiency. (OWRT)
W76-08372

DEVELOPMENT OF REVERSE OSMOSIS MEMBRANES AND SPIRAL DESIGN MODULES FOR DEMINERALIZATION OF BRACKISH WATERS AT LOW PRESSURES,
Gulf Environmental Systems Co., San Diego, Calif.
G. E. Foreman, C. R. Mungle, S. S. Kremen, and W. W. Wright.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 566, $5.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/44, August 20, 1973. 76 p, 16 fig, 19 tab, 1 ref. 14-30-2853 and 14-30-3006.

Descriptors: *Desalination, Desalination processes, *Reverse osmosis, *Membrane processes, Brackish water, *Membranes.
Identifiers: *Low pressure membranes, Spiral wound modules, Cellulose acetate membranes.

Part 1 describes work directed toward the development of a low-pressure membrane for the desalination of brackish waters. The membranes developed are capable of producing between 20 and 25 gallons of permeate per square foot of membrane area per day with with an 85% rejection of chloride ion when tested on a feedwater of 3500 mg/l sodium chloride and at feed pressure of 300 psig. Part 2 describes work directed toward manufacturing fabric-supported membranes and incorporating these into spiral wound reverse osmosis membrane elements. The elements fabricated with this membrane/fabric composite were capable of water flux rates between 14 and 20 gal/ft2/day with chloride ion rejections between 80% and 60% and magnesium ion rejection in excess of 95% when tested at 200 psig on a feedwater containing 2000 mg/l sodium chloride and 1000 mg/l magnesium sulfate. (OWRT)
W76-08373

DESALTING HANDBOOK FOR PLANNERS.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 755, $9.75 in paper copy, $2.25 in microfiche. OWRT/S--76/47-First Edition, May 1972. 315 p, 88 fig, 9 tab, 49 ref.

Descriptors: Desalination plants, *Desalination processes, Water supply, Water costs, Economics, *Planning, Evaluation, *Research and development, Distillation, Flash distillation, Electrodialysis, Reverse osmosos, Freezing, Ion exchange, Pre-treatment(Water), *Estimated costs, *Design criteria, Construction, Waste water treatment.

This Handbook is a compendium of information resulting from the Office of Saline Water (OSW) desalting program. Major sources of data include published reports of: (1) research and development, (2) potential applications, and (3) process economics by various OSW contractors and cooperators. Reference to these sources are included in the Handbook. Under sponsorship of the OSW Desalting Feasibility and Economic Studies Staff, the Bureau of Reclamation has compiled and organized the data together with background information and input from OSW in a form suitable for water planners' use. The Handbook has been prepared for use in preliminary planning as a source of up-to-date information on the state of development, costs, economics, and applicability of those desalting processes which are available for providing water supply. It is anticipated that the Handbook will fill a particular need in conducting Western U. S. Water Plan Studies. The Handbook is not meant to substitute for the thorough engineering and economic analysis that should precede the decision to build a desalting plant.
W76-08584

3B. Water Yield Improvement

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-08108

MULTIPLE USE EVALUATIONS ON PONDEROSA PINE FOREST LAND,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08109

PINYON-JUNIPER CONTROL--DOES IT PAY,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08110

RESEARCH AND DEVELOPMENT OF AN AIRBORNE HYGROSCOPIC SPRAY SYSTEM,
Mee Industries, Inc., Rosemead, Calif.
T. R. Mee.
Report 76-1, April 1976. 53 p, 19 fig. Bur Reclam 14-06-D-7634.

Descriptors: Research and Development, Cloud physics, *Cloud seeding, Distribution, Weather modification.
Identifiers: Airborne spray system, Atomization, Atomizers, Ammonium nitrate-urea.

Three different atomization techniques: direct pressure nozzles, air jet nozzles and spinning cylinder devices, were investigated to determine which would be most suitable for development into an airborne hygroscopic spray system. The system was to be capable of producing controlled droplet spectrums ranging from 20um MMD to 200um MMD, of an ammonium nitrate-urea solution to be used as a hygroscopic seeding material. The system was to be capable of atomizing the solution at rates of 2 liters per second. Tests were conducted under static no wind conditions and in a 110 m/s air stream. The most suitable atomization device was a direct pressure impaction type nozzle. A prototype airborne spray system has been designed using this type of nozzle. (Bureau of Reclamatin)
W76-08111

PARTICLE VAPORIZER,
Department of the Navy, Washington, D.C.
I. Koff.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-D000 630, $4.50 in paper copy, $2.25 in microfiche. Navy Case No. 55214, June 27, 1974. 6 p, 1 fig.

Descriptors: *Weather modification, *Cloud seeding, *Weather, *Artificial precipitation, *Climatology, Meteorology, Climatic data, Clouds, Rain, Snow, Precipitation(Atmospheric), Artificial storms, Cloud physics, Water shortage, Gases, Water supply, Physical properties, Nucleation, Equipment, Silver iodide, Solvents.
Identifiers: *Particle vaporizer, Weather modification nuclei, Cloud seeding apparatus, Weather modification apparatus, Invention, Vaporizer, Blower, Feed hopper, Heated tube, Flammable solvent, Dry particles, Weather modification material.

A method was described for dispersing weather modification nuclei. The government-owned invention, Serial No. 483,862, is available for licensing. The apparatus consists of a blower and a feed hopper which houses the dry particles of weather modification material. The dry material is

fed into the stream of gas coming from the blower into a dusting chamber where the particles are separated, then pass into a heated tube where they are vaporized. The vapor is then dispersed into the atmosphere and forms weather modification nuclei. (Henley-ISWS)
W76-08148

DESIGN OF AN EXPERIMENT TO SUPPRESS HAIL IN ILLINOIS,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr., and G. M. Morgan, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-253 446, $7.75 in paper copy, $2.25 in microfiche. ISWS Bulletin 61, 1976. 194 p, 48 fig, 36 tab, 101 ref, 6 append. NSF GI-37859, ERT73-0770.

Descriptors: *Hail, *Weather modification, *Cloud seeding, *Project planning, *Illinois, Agriculture, Networks, Sampling, Radar, Projects, Project benefits, Economics, Social aspects, Forecasting, Surveys, Evaluation, Climatology, Cloud physics, Meteorology.
Identifiers: *Hail suppression, Severe weather.

This final report for a 2 1/2-year project presented an optimum design for a hail suppression experiment in Illinois. the design was based on 9 years of hail research geared to hail modification planning. Studies of 3-cm and 10-cm radars, surface hail measurements, weather analysis and objective forecasting techniques, aircraft measurements of cloud properties, seeding technologies, and evaluation techniques were reviewed in detail. The hail suppression experiment design included the modification hypothesis and related seeding technologies, the statistical-physical design and evaluation, operational requirements, and impact monitoring and public interaction efforts. The advisability of conducting such an experiment at this time was discussed. (Sims-ISWS)
W76-08330

FIRST-YEAR WATER YIELD INCREASE AFTER FOREST CUTTING: AN ALTERNATIVE MODEL,
Forest Service (USDA), Athens, Ga. Forestry Sciences Lab.
For primary bibliographic entry see Field 4C.
W76-08362

WATER YIELD IMPROVEMENT BY VEGETATION MANAGEMENT: FOCUS ON ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. F. Ffolliott, and D. B. Thorud.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 055, $28.25 in paper copy, $2.25 in microfiche. College of Agriculture, Report UA/SRNR-75-01, 1975, 1,048 p. OWRT A-042-ARIZ (10) US For. Ser. 16/257/CA; OWRT 14-31-0001-3803.

Descriptors: *Water yield improvement, Water resources, Surface waters, *Forest management, *Watersheds(Basins), Snowmelt, *Arizona, Vegetation, *Runoff, Pine trees, Watershed management, *Land use, Fir trees, *Vegetation establishment, Bibliographies, Reviews.
Identifiers: *Vegetation management.

This assessment of the potentials for increasing water yield in Arizona by means of vegetation management is based on a review of the Arizona Watershed Program, which began in 1957. A summary of research is provided for: alpine vegetation zone, mixed conifer forests, aspen forests, ponderosa pine forests, pinyon-juniper woodlands, chaparral vegetation zone, grassland vegetation zone, desert shrub vegetation zone, and riparian association zone. Some of the topics covered are vegetation, climatic, edaphic, physiographic, and wildlife and fisheries characteristics and treatment effects on water yield, water quality, forage, and timber production. An estimate is made for water yield results if mixed conifer forests, ponderosa pine forests, and chaparral vegetation zones were treated at different intensities, for each of 15 basins in Arizona. These estimates have a hypothetical structure and are presented for demonstrating the upper potentials for water yield improvement, according to research results from experimental watersheds. Bibliographies follow each of the chapters on vegetation types.
W76-08539

WATER USE BY SALTCEDAR AS MEASURED BY THE WATER BUDGET METHOD,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 2D.
W76-08573

THE RESPONSES OF SOILS AND SOIL MICROORGANISMS TO SILVER IODIDE WEATHER MODIFICATION AGENTS,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W76-08670

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 2B.
W76-08694

3C. Use Of Water Of Impaired Quality

A COMPARATIVE STUDY OF THE EFFECT OF QUALITIES OF IRRIGATION WATER ON DIFFERENT SOILS,
Udaipur Univ. (India). Coll. of Agriculture.
P. Lal, and K. S. Singh.
J Indian Soc Soil Sci. 22(1), p 19-25, 1974.

Descriptors: *Wheat, *Soils, *Irrigation water, Fertilization, Electrical conductance, Adsorption, Salts, Clays, Hydraulic conductivity.
Identifiers: *Sodium adsorption ratio.

Pot experiments using different types of soils, irrigation waters and fertilizer levels were carried out with wheat. With waters of similar EC (electrical conductivity) values, the accumulation of salts in the soil increased with an increase in the clay and with increasing SAR (sodium adsorption ratio) of waters. SAR, ESP (exchangeable sodium percentage) and pH of soils were closely related to the SAR of irrigation water. ESP increased with an increase in salt concentration of irrigation water and SAR of the soil pH value decreased with a rise in clay percentage of the soil. Hydraulic conductivity decreased with an increase in SAR of irrigation water, while it increased with increasing salt concentration of water. An increase in clay resulted in reduced hydraulic conductivity.--Copyright 1975, Biological Abstracts, Inc.
W76-08301

SALT AND WATER BALANCE IN IMPERIAL VALLEY, CALIFORNIA,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
M. T. Kaddah, and J. D. Rhoades.
Soil Science Society of America Journal, Vol. 40, No. 1, p 93-100, January-February 1976. 4 fig, 2 tab, 13 ref.

Descriptors: *Water balance, *Soil management, Water management(Applied), Conservation, *Irrigation effects, *Irrigation practices, *California, Management, Watershed management, Irrigation systems, Salinity, Chemical properties, Irrigation water, Soil chemical properties, Water quality, Irrigation, Surface runoff, Groundwater, Root zone, Effluents, Irrigated land, *Salt balance, Inflow.
Identifiers: *Salinity trends, *Imperial Valley(Calif), Dissolved salts, Salt balance index, Soil salinity, Cropping, Water use patterns.

Salt balance of the Imperial Valley (IV) has been determined annually since 1943 by the Imperial Irrigation District. Salinity trends in the valley are assessed from biweekly measurements of the volume, V, and concentration, C, of influent, inf.w, and effluent, eff.w, waters. In this paper, the SB data were summarized, their significance was evaluated, and approaches for assessing salinity trends in the soils of the valley were suggested. The SB data reflected the cropping and water use patterns in the valley. However, the data were insufficient to distinguish origin of water and salt in effluent waters or to provide information about changes in root zone salinity. In 1973 total evapotranspiration (ET) by crops in the valley was estimated to be 229,000 ha-m, equivalent to 70% of the water delivered to the farmers. Deductions as to Cl(-) composition of influent and effluent during 1973 suggested that the Cl(-) load in the effluent water was contributed as follows: 54.7% from groundwater, 35.0% from root zone drainage water, and 10.3% from tail water (runoff). A more definitive interpretation of the salt balance data would require more accurate evaluation of volume of tail and consumptive use waters and volume and concentration of root zone percolate. If this information cannot be obtained on a valley-wide basis, then an alternative approach is to establish a representative number of soil salinity monitoring plots through the valley and assess their root zone salinity periodically. (Henley-ISWS)
W76-08331

ESTIMATING WATER SALINITY WITH GEOPHYSICAL EARTH RESISTIVITY EQUIPMENT,
Agricultural Research Service, Sidney, Mon.
For primary bibliographic entry see Field 2K.
W76-08332

RATE OF CHLORIDE AND WATER MOVEMENT IN SOUTHERN CALIFORNIA SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W76-08545

TRICKLE IRRIGATION WITH WATER OF DIFFERENT SALINITY LEVELS,
Guyton (William F.) and Associates, Austin, Tex.
W. J. Seifert, Jr, E. A. Hiler, and T. A. Howell.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 1, p 89-94, January-February 1975. 8 fig, 2 tab, 16 ref.

Descriptors: *Salinity, *Saline water, Irrigation, *Irrigation effects, *Sorghum, Surface irrigation, Lysimeter, Leaching, Crop response.
Identifiers: *Trickle irrigation, *Drip irrigation.

Objectives were (a) to determine effects of different concentrations of saline water on grain sorghum production and soil environment using trickle irrigation, and (b) to evaluate effects of irrigation water at one electrolyte concentration with both surface and trickle irrigation. The study was conducted in a sheltered lysimeter installation during two successive seasons. A Norwood silt loam soil was utilized in the lysimeters. Salts were purposely not leached between seasons so that salinity buildup effects could be evaluated. Numerous crop, soil and meteorological parameters were measured and evaluated to quantify effects of various treatments on the crop and soil. (Skogerboe-Colorado State)
W76-08550

CALCULATED DRAINAGE WATER COMPOSITIONS AND SALT BURDENS RESULTING FROM IRRIGATION WITH RIVER WATERS IN THE WESTERN UNITED STATES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 5B.
W76-08671

3D. Conservation In Domestic and Municipal Use

RESIDENTIAL WATER CONSERVATION,
California Univ., Los Angeles. School of Architecture and Urban Planning.
M. Milne.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 253, $12.00 in paper copy, $2.25 in microfiche. Report No. 35, California Water Resources Center, March 1976. 468 p. 250 ref. (California Water Resources Center Project UCAL-WRC-W-424). OWRT-A-048-CAL(1).

Descriptors: *Water conservation, *Domestic water, *Water consumption, Plumbing, Economics, Attitudes, Social aspects, Motivation, Domestic water, Water utilization.

A non-technical report is presented for homeowners, builders, developers, architects, planners, utility company managers, plumbingware manufacturers, and lawmakers who are seeking ways to reduce residential water consumption. A'typical' residential consumption profile is presented, along with a brief history of how water has been used in the home. Water conservation is not simply a matter of inventing new fixtures; four types of constraints must be satisfied before any innovation in water conservation can be implemented: economic, institutional, sociocultural, and technological. The impact of each of these factors is discussed. Over four dozen commercially available devices which affect water consumption in the home are evaluated. In an attempt to discover future trends, a survey was made of the relevant aerospace technology, including Apollo and Skylab systems, as well as the systems installed in commercial jet aircraft, trains, and ships. Recent patent applications were searched and dozens of new water-conserving fixtures and appliances were discovered. Four scenarios are laid out to show the homeowner different strategies for reducing water consumption. A series of recommendations is made defining specific actions that can be taken by utility companies, lawmakers, and plumbingware manufacturers to reduce residential water consumption. The Appendix contains a 250-item annotated bibilography and a directory of manufacturers. The only alternative to continually increasing the supply of water is to reduce the demand. This report explains the various ways that can be done. (Snyder-California,Davis)
W76-08103

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, CONSTRUCTION GRANTS.
Touche, Ross and Co., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08194

AN ANALYSIS OF U. S. ENVIRONMENTAL PROTECTION AGENCY'S NEEDS SURVEY,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-08195

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, URBAN RUNOFF.
Black, Crow and Eidsness, Ind., Atlanta, Ga.; and Jordan, Jones and Goulding, Inc. Atlanta, Ga.
For primary bibliographic entry see Field 5G.
W76-08222

DEVELOPMENT OF STORM DRAINAGE COST FUNCTIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, and J. P. O'Hearn.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. HY4, Proceedings paper No. 12069, p 515-526, April 1976. 9 fig, 6 tab, 26 equ, 7 ref. OWRT B-086-Colo(3)

Descriptors: Water resources, *Planning, *Flood control, Economics, Hydraulics, *Costs, *Estimating, Equations, Systems analysis, Hydrology, Engineering, *Design criteria, Sewers, Networks, *Storm drains, *Urban drainage.
Identifiers: Urban development, Cost estimates, Cost functions.

Planners must have simple quantitative relationships to rapidly but accurately estimate the costs of urban drainage facilities. Using fundamental concepts of urban hydrology, engineering design, and cost estimation, relationships are derived between percent imperviousness of urban areas, return period of design storm, and the resulting cost of drainage facilities. Increasing design return periods demand greater storm sewer sizes and additional coverage of drainage basins by the sewer network. A case study demonstrates rapid increases in cost from 1-year to 10-year return periods, but reduced rates of increase from 10-year to 100-year designs. The relationships developed will be useful for tradeoff decisions between levels of urbanization, storm drain design criteria, and the resulting cost of facilities. (Bell-Cornell)
W76-08227

MEASURING WATERSHED LAND-USE CHANGES WITH AIRPHOTOS,
Clemson Univ., S. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-08229

THE WATER SUPPLY SYSTEM OF A LARGE URBAN AGGLOMERATION IN SWITZERLAND (DIE WASSERVERSOWGUNG EINER SCHWEIZERISCHEN GROSS-AGGLOMERATION),
For primary bibliographic entry see Field 5F.
W76-08233

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE II' - VOLUME 1--DRY WEATHER FLOWS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08278

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 2, IMPACTS OF DUST STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08279

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 3 - ANALYSIS OF FLOW MODELS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08280

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 4 - PROJECT SUMMARY,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08281

URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Upper Darby, Pa. Engineering Div.
For primary bibliographic entry see Field 4D.
W76-08509

NONPARAMETRIC STATISTICAL ANALYSIS OF ANNUAL PEAK FLOW DATA FROM A RECENTLY URBANIZED WATERSHED,
Mount Rogers Planning District Commission, Marion, Va.
For primary bibliographic entry see Field 4C.
W76-08522

THERMAL SCANNER MEASUREMENTS OF CROP TEMPERATURES TO ESTIMATE EVAPOTRANSPIRATION,
For primary bibliographic entry see Field 2D.
W76-08591

RESOURCE RECOVERY: POSSIBILITIES AND PITFALLS,
International City Management Association, Washington, D.C. Management Development Center.
For primary bibliographic entry see Field 5D.
W76-08692

3E. Conservation In Industry

UTILISATION OF BLOOD,
Agricultural Research Council, Langford (England). Meat Research Inst.
J. M. Akers.
Food Manufacture, p 31-32. April, 1973, 9 ref.

Descriptors: *Food Processing Industry, *By-products, Waste water treatment, Industrial wastes.
Identifiers: *Meat packing wastes, *Blood recovery, Blood preservation, Economic potential.

Large quantities of blood wasted from abattoirs represent a big loss of valuable protein. By improving collection and preservation methods and by proper organization of supply and demand, marketing of blood for use in human and animal foods could be commercially viable. An improved collection method includes use of a hollow sticking knife recently patented in Germany, incorporating anticoagulant feeds into the head of the sticking knife, and total enclosure of the system to prevent the introduction of contaminants. This system results in blood recovery of 30 to 40 percent over open pan methods. Methods of preservation include addition of sodium metabisulfite, urea, or ammonia as stabilizers. The use of ammonia as a preservative in conjunction with a polyphosphate type of anticoagulant permits up to 1.5 days unrefrigerated storage of the blood before it is processed into dried separated plasma and red cells. Conclusions are: 1. improvement of hollow bleeding knives can be expected, 2. the process of separation of plasma has been highly developed, 3. to be economically viable, large plants collecting blood from several slaughterhouses will be required, and 4. markets for plasma and red blood cell debris must be established. (EPA - Corvallis)
W76-08166

DUCK-PROCESSING WASTE,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
G. L. Morris.
U. S. Dept HEW Environmental Health Series-Water Supply & Pollution Control. Public Health Service Publication No. 999-WP-31, July 1965. 13 p, 6 tab, 5 ref.

Descriptors: *Food processing industry, Industrial wastes, Industrial water, Water consumption, Wastes, Coliforms, *Treatment facilities, Water utilization, New York, Waste water treatment.
Identifiers: *Duck-processing industry, *Poultry processing industry, Wastewater characterization, Waste load, Long Island(NY).

Two duck-processing plants located on Long Island were studied to obtain waste load and water use data for comparison with chicken processing data. Weighted averages for both plants studied indicate water use of 23.6 gallons and waste loads of 0.0419 pound BOD and 0.0289 pound of suspended solids per duck processed. Similar values for chicken processing are 8 gallons of water 0.025 pound of BOD, and 0.013 pound of suspended solids per bird. Comparisons between duck and chicken processing on the basis of 1000 pounds of live birds indicate water usage is 3,600 gallons for ducks and 2,300 gallons for chickens; BOD values are 6.4 pounds for ducks and 7.18 pounds for chickens; and suspended solids values are 28.9 pounds for ducks and 13 pounds for chickens. Wastewater coliform values were 56,800 per 100 milliliter in plant A and 49,200 per 100 milliliter in plant B. (EPA-Corvallis)
W76-08168

EGG-PROCESSING PLANT WASTES,
South Dakota State Univ., Brookings.
J. R. Schultz, J. N. Dornbush, and D. A. Rollag.
Presented at 30th Annual Purdue Industrial Waste Conference Purdue University, West Lafayette, IN, May 6-8 1975. 26 p, 1 fig, 8 tab, 4 ref.

Descriptors: *Food processing industry, Waste identification, Water consumption, Industrial water, Industrial wastes, *Waste water treatment, Treatment facilities, Nebraska, Treatment facilities.
Identifiers: *Egg grading, Breaking, Processing plants, Waste water characterization, Waste water volume, Waste water reduction, Product recovery.

The investigations described provide information concerning the characteristics and volume of liquid waste resulting from the processing of eggs. The studies were conducted at the Milton G. Waldbaum plant, Wakefield, Nebraska. Over one million cases of eggs are processed at the plant each year. Processing operations include the washing, grading, breaking, and drying of eggs. The characteristics and volume of waste streams from individual processing operations and 24-hour composites of the overall plant waste were obtained and are reported. Using raw product input and wastewater data from the Waldbaum Plant, unit waste production was estimated for grading and breaking in terms of the pounds of BOD5 and gallons of wastewater resulting from processing each 100 cases of eggs. The results of these investigations also disclosed instances where waste reduction and egg-product recovery might be possible. (EPA - Corvallis)
W76-08170

WATER-RECYCLE WASHING OF REFINED SOYBEAN OIL: PLANT SCALE EVALUATION,
Anderson Clayton Foods, Inc., Sherman, Tex.
R. E. Beal, L. T. Black, E. L. Griffin, J. C. Meng, and G. S. Farmer.
Journal of American Oil Chemists Society, Vol. 50, p. 260-263, 1973. 1 fig, 6 tab, 9 ref.

Descriptors: *Food Processing Industry, *Soybeans, *Waste Water treatment, Recycling, *Water reuse.
Identifiers: *Soybean Oil Refinery, Wash Water Recycle, Economic Analysis.

A series of 24 hour tests was made in a commercial refinery under eight different operating conditions to select optimum conditions for a subsequent longer test of the antipollution recycle-washing process wherein wash water is recycled instead of being discarded. Alkali-refined oil was continuously washed at a rate of 15,000 lb/hr to remove sodium. Recycled wash water was then treated with a cation exchange resin to remove sodium. Two wash water pH levels, two oil-water ratios and the addition of a sequestering agent ethylene diamine tetraacetic acid (EDTA) to wash water, were factors investigated. For the longer test a water pH of 3.0 and an oil-water ratio of 4:1 were used, and EDTA was not added. Operating and analytical data, equipment specifications and cost data were acquired. The washed oil had a satisfactorily low content of sodium, iron and copper. After it was bleached the oil hydrogenated at a rate comparable to that of a conventionally washed oil. The bleached, deodorized oil had satisfactory flavor and flavor stability. The exchange resin required periodic caustic cleaning to maintain capacity. The new recycle process provides an economic solution to the wash water disposal problem. (EPA-Corvallis)
W76-08171

PAUNCH HANDLING AND PROCESSING TECHNIQUES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
J. L. Witherow.
The National Provisioner, Vol. 171, No. 17, October 26, 1974, p. 14-22. 1 fig, 1 tab, 36 ref.

Descriptors: *Food Processing Industry, *Industrial Wastes, *By-Products, *Waste Disposal, Soil Conservation, Waste water treatment, Waste treatment.
Identifiers: *Meat Packing Wastes, *Paunch Handling and Processing, Paunch Composition.

Three handling systems for paunch are presented and over a dozen processing techniques are discussed. The handling processes are the no dump, wet dump, and dry dump methods. Processing techniques covered are: (1) surface spreading, (2) subsurface spreading, (3) mixing with refuse, (4) mixing with feeds, (5) rendering, (6) rotary dryers, (7) fluid bed dryer, (8) solar and air drying, (9) filters and screens, (10) Incineration, (11) pyrolysis, (12) composting, (13) ensilage, (14) single cel protein cultures, (15) digestion, and (16) board mill. For handling, the dry dump is replacing the wet-dump, thus enabling more effective pollution control and by-product recovery. Of the possible processing methods, the production of soil conditioners by surface and/or subsurface spreading and the production of feeds by ensilage or drying appear to be the most feasible. Information also is given on the pollution potential and the composition of dehydrated paunch. (EPA - Corvallis)
W76-08173

REPORT ON METHODS OF CHROME RECOVERY AND REUSE FROM SPENT CHROME TAN LIQUOR,
Cincinnati Univ., Ohio. Tanners' Council Lab.
For primary bibliographic entry see Field 5D.
W76-08174

SOME ASPECTS OF TANNERY EFFLUENT CONTROL,
Garden State Tanning Co., Reading, Pa.
For primary bibliographic entry see Field 5D.
W76-08175

RECYCLING OF LIME-SULPHIDE UNHAIRING LIQUORS - I, SMALL-SCALE TRIALS,
Commonwealth Scientific and Industrial Research Organization, Parkville (Australia). Div. of Protein Chemistry.
For primary bibliographic entry see Field 5D.
W76-08179

A VERY RAPID LIMING AND TANNING PROCESS WITHOUT EFFLUENT,
Technische Hochschule, Darmstadt (West Germany). Institut fuer Makromolekulare Chemie.
E. Heidemann, O. Harenberg, and J. Cosp.
Journal of the American Leather Chemists Association, Vol. 68, No. 1, p. 520-532, December 1973. 1 fig, 1 tab, 3 ref.

Descriptors: *Tannery wastes, *Waste water treatment, Industrial wastes, Lime.
Identifiers: *Process change, Sodium Peroxide unhairing, Beamhouse, *Liming.

Reported are the results of a pilot-scale process using sodium peroxide for unhairing pelts. When the hides are placed in a strong sodium peroxide solution the hair is destroyed quickly and the fiber structure is opened up in an hour. The complete process, from the raw hides to a wet blue leather stock, takes only six hours. (EPA-Corvallis)
W76-08181

NO-EFFLUENT TANNERY PROCESSES,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
D. A. Williams-Wynn.
Journal of the American Leather Chemists Association, Vol. 68, No. 1, p. 5-13, January 1973. 1 fig, 1 tab, 15 ref.

Descriptors: *Tannery wastes, Industrial wastes, Waste water treatment, Lime.
Identifiers: *Process change, Salt curing, Beamhouse, Liming, No-effluent tannage, Livitan process.

Reviewed are methods for eliminating or reducing the waste load from the individual processes in leather tanning. Alternatives to salt curing are proposed including one method which uses sodium chlorite. None of the methods is suitable for long term storage of hides. In the beamhouse, alternatives to liming are proposed with the most promising one being the use of caustic soda. However, as with the use of lime, it creates a sludge problem. Experiments have shown that tanners apply much more lime (4 percent solution) than necessary (1 percent solution), resulting in undissolved lime remaining in the effluent. Vegetable tannages with essentially no effluent are discussed. These are the Liritan (Leather Industries Research Institute) process and the more advantageous Liritan Semi-Rapid Sole Leather Tannage now in use in South Africa. The latter combines the no effluent properties of the former with the speed of drum tanning. (EPA-Corvallis)
W76-08182

WASTE TREATMENT AND CONTROL AT LIVE OAK POULTRY PROCESSING PLANT,
Gold Kist Inc., Atlanta, Ga.
W. J. Camp.
Presented at 18th Southern Water Resources and Pollution Control Conference, North Carolina State University, Raleigh, NC. April 9, 1969, p 36-40.

Descriptors: *Food processing industry, *Industrial wastes, *Waste water treatment, By-Products, Activated sludge, Florida, Waste treatment, *Aeration.
Identifiers: *Poultry processing wastes, *Extended aeration tanks.

An extended aeration system was installed to treat wastewaters from a poultry complex which in-

cludes a hatchery, feed mill, processing plant, and by-products plant. The waste treatment plant consisted of (1) a lift station with three collection tanks for segregation of waste streams, (2) a by-products collector tank, (3) two extended aeration tanks, (4) final settling tank with .35 MGD sludge return, (5) an aerobic digestor adjacent to and integral with extended aeration tanks, (6) a four acre polishing pond with chlorination, and (7) two sludge drying beds. Results are: (1) water usage about 7.6 gallons per bird, (2) BOD loading about 39 pounds per thousand birds, (3) in the by-product collector 35-45 percent removal of BOD 54-70 percent removal of suspended solids and 56-71 percent removal of grease. (4) 98.9-99.5 percent BOD removal in final clarifier effluent with 15 mg/l maximum and 8 mg/l average. Suspended solids removal of 98 percent with 10 mg/l maximum and 6 mg/l average and, (5) final effluent shows 99-100 percent BOD removal with 8 mg/l maximum and 3 mg/l average. (EPA-Corvallis)
W76-08185

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, TEXTILE INDUSTRY.
Lockwood Greene Engineers, Inc., Spartanburg, S. C.
For primary bibliographic entry see Field 5G.
W76-08186

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, CANNED AND PRESERVED FRUITS AND VEGETABLES,
Environmental Associates, Corvallis, Oreg.
For primary bibliographic entry see Field 5G.
W76-08187

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE ORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08188

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE INORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08189

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES PETROLEUM REFINING INDUSTRY, PART 1, CHAPTERS -V.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08190

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, PETROLEUM REFINING INDUSTRY, PART 2, CHAPTERS VI - IX.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08191

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, THE PERMIT PROGRAM.
Energy and Environmental Analysis, Inc., Arlington, Va.
For primary bibliographic entry see Field 5G.
W76-08193

WASTE WATER RECYCLED FOR USE IN REFINERY COOLING TOWERS,
Mobil Oil Corp., East Chicago, Ind.
For primary bibliographic entry see Field 5D.
W76-08270

CANADIAN MILLING PRACTICE FOR WATER RE-USE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Mineral Processing Div.
For primary bibliographic entry see Field 5D.
W76-08272

ALTERNATIVES FOR REDUCING WATER POLLUTION IN CATTLEHIDE PROCESSING AND TANNING,
Economic Research Service, Washington, D. C. National Economic Analysis Div.
F. J. Poats, and J. Naghski.
In: USDA, Economic Research Service Marketing and Transportation Situation. MTS-191, p 29-33, November 1973, 1 fig, 1 tab.

Descriptors: *Tannery wastes, *Economic feasibility, Alternative planning, Alternative costs, Industrial wastes.
Identifiers: *Hide processor, *Transfer of operations.

Alternatives are presented to the traditional method of receiving salt cured hides in the tannery. Two solutions are proposed; (1) Transfer of beamhouse operations to hide processor where green hides would be blue chrome tanned and (2) transfer of total tanning operations to the hide processor who would then market fully tanned (crust) leather to the finisher. The feasibility of the two alternatives was determined. Preliminary results indicate both processes would be feasible from a leather quality point of view. Analysis regarding the economic feasibility of the alternatives will be reported later. Problems the industry would experience upon adoption of either alternative would be (1) the question of the marketability of chrome-tanned leather, (2) investment in new equipment by hide processor and relocation of skilled labor, (3) loss of internal quality control of hide material by tanners and (4) maintenance of salt-curing facilities to supply the export market. (EPA-Corvallis)
W76-08285

THE INFLUENCE OF SOILS AND PLANT COVER ON THE RETENTION AND UTILIZATION OF SUSPENDED AND DISSOLVED MATERIALS IN THE WASTE WATER OF A POULTRY PROCESSING PLANT,
Clemson Univ., S. C. Dept. of Agricultural Chemical Services.
For primary bibliographic entry see Field 5D.
W76-08287

NEW APPROACHES POINT TO BETTER ECONOMIES IN HIDE PROCESSING,
The National Provisioner, Vol. 172, No. 2, January 11, 1975 p. 18-20, 22, 27-28.

Descriptors: *Tannery waste, *Food processing industry, Industrial wastes, Industrial production, By-products, Proteins, *Waste water treatment, Costs.
Identifiers: *Hide processing industry, Solvent hide dehydration, Hide curing, Protein reclamation.

Discussed are hide curing by the solvent dehydration method, cost advantage of processing fresh hides into crust leather, short-term preservation of hides, and protein reclamation from unhairing effluents. The solvent dehydration method using acetone produces a hide that is lighter in weight, is soft and supple enough to ship in many convenient ways, and has a long storage life. Buying and selling is done on graded stock. By using fresh instead of salt-cured hides the tanner could reduce costs as much as 0.75 cents per hide and increase revenues by 3 percent. Present problem in implementation is the scattered locations of the slaughtering industry. Benzalkonium chloride solutions preserve hides for five days. Sodium sulfite or bisulfite and acetic acid will preserve fleshed and de-manured hides for up to 28 days. Protein reclamation of unhairing effluents by catalytic sulfide oxidation acidification to pH 4.2 produces a precipitate with a protein product of 80% purity and reduces the COD by 70%. (EPA-Corvallis)
W76-08288

WASTEWATER CONTROL AT EGG PRODUCTS PLANTS, PT. 1-3.
Poultry and Egg Inst. of America, Washington, D.C.
Informal Report, September 26, 1974, 12 p.

Descriptors: *Food processing industry, Industrial wastes, Industrial water, Water consumption, Effluents, Industrial production, Wastes, Biochemical oxygen demand, Chemical oxygen demand, *Waste water treatment, Poultry.
Identifiers: *Egg products plants, Waste management questionnaire, Wastewater characterization, In-plant wastewater control, Egg washing, Egg breaking.

Waste status in egg breaking plants, the estimation of BOD and COD for egg products, and in-plant wastewater control are the topics covered. Waste status was determined by a survey questionnaire sent to egg breaking plants. Information was obtained on production, water use, method of wastewater disposal, amounts of inedible eggs and shells, and any existent or anticipated problems in disposing of wastewater. About 2/3 of the plants use municipal sewers. Private systems could not handle increasing loads and/or meet discharge standards. BOD5 loads ranged from 11 to 70 pounds per 1000 pounds of product and wastewater volume varied from 0.4 to 2.7 gallons per pound of product. BOD and COD were determined from the amount of oxygen necessary to oxidize the various elements in the egg and were calculated to be 1.88 and 3.30 gms plr gram egg solids and per gram egg carbon respectively for the whole egg. Similar calculations were made for egg whites, yolk, and liquid egg products. Several in-plant areas which offer possibilities for waste load reduction are discussed. (EPA-Corvallis)
W76-08291

WASTES FROM THE POULTRY PROCESSING INDUSTRY,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
R. Porges, and E. J. Struzeski.
Technical Report SEC TR W62-3, 1962. 40 p, 15 fig, 4 tab, 40 ref.

Descriptors: *Food processing industry, *Reviews, Industrial wastes, Industrial water, By-products, *Waste water treatment, Waste identification, waste treatment, Water consumption, Water pollution control, Water pollution treatment, Biological treatment, Poultry.
Identifiers: *Poultry processing industry, State-of-the-art reviews, Waste water volume, waste water characterization, In-plant control.

Descriptions are presented of the processes employed in a poultry processing plant, the sources and characteristics of wastes, the total plant wastes and their pollutional effects, means for reducing the waste load, and separate and combined treatment of poultry wastewaters. Blood from the killing area represents the waste of greatest pollutional significance with its BOD5 of approximately 100,000 mg/l. Other critical areas are defeathering and eviscerating. Recovery for by-product useage significantly reduces the waste load. Blood recovery alone will reduce the BOD5

of the effluent from 35 to 23 pounds per 1000 birds. Treatment methods recommended for the wastes are grease traps, primary settling, extended aeration activated sludge, stabilization ponds, and land irrigation. (EPA - Corvallis)
W76-08292

DESIGN AND PERFORMANCE OF PHYSICAL-CHEMICAL AND ACTIVATED SLUDGE TREATMENT FOR AN EDIBLE OIL PLANT,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 5D.
W76-08293

RECYCLING OF WATER IN POULTRY PROCESSING PLANTS,
Stanford Research Inst., Menlo Park, Calif.
C. J. Rogers.
Summary Report, March 21, 1975. 37 p, 6 fig, 11 tab. EPA S-800930.

Descriptors: *Food processing industry, *Water consumption, *Recycling, Diatomaceous earth, Filtration, Ultraviolet radiation, Waste water treatment, Screens, Water reuse, Operating costs, Activated carbon, Industrial wastes.
Identifiers: *Poultry processing industry, *Chiller water.

Studies were conducted on recycling chiller water in a poultry processing plant. The recycling system must be provided with the capability of removing solids and controlling the microbial population. UV light was used to control the microbial population. For effective control, solids must be removed to a level to allow light transmission. Methods studied include: (1) cyclonic desludgers, (2) vibrating screens, (3) flotation cells, (4) centrifugal waste concentration, (5) filtration with diatomaceous earth (DE) filter aid, and (6) activated carbon. Pilot-scale results showed that DE filtration was the most feasible option and that it maintained the bacterial level below that of the nonrecycled system. Operating costs for the De filtration system with 30 gallon equivalence of ice per minute are $79.06/day. Normal operating costs of the chiller without recycle are $146.90/day, thus savings of $67.84/day result. These do not include manpower and equipment costs. Figures are based on a system that overflowed 100 gpm for an 18 hour day. (EPA - Corvallis)
W76-08298

USE, CONTINUED USE, AND REUSE OF BOTH PROCESS AND WASTE WATERS IN POULTRY PROCESSING OPERATIONS,
North Carolina State Univ., Raleigh. Dept. of Economics.
J. A. Macon, W. M. Crosswhite, and R. E. Carawan.
Presented at 20th Southern Water Pollution Control Conference, Chapel Hill, NC, April 1971. 20 p, 2 fig, 5 tab.

Descriptors: *Food processing industry, *Waste water treatment, *Water reuse, Industrial wastes, Operations, Waste treatment, Biochemical oxygen demand, Effluents, Treatment facilities, North Carolina.
Identifiers: *Poultry processing wastes, *Waste reduction, In-plant changes, Blood recovery.

Benchmark information is given on water and waste quantities, waste water characteristics and biological characteristics of both the product and water at selected points throughout the Gold Kist, Inc., Durham, NC poultry processing plant. Areas of water use reduction are defined and consist of 1. evisceration, 2. scalding and defeathering, and 3. cleanup. Changes made in these areas include use of improved nozzles, use of eviscerating flume water for fresh water in scalding and defeathering, use of chiller water in scalder, and use of high-pressure cleaning systems with foam. Waste reduction measures were an improved blood recovery system and the use of stunners prior to killing to reduce body action. Results reported are: 1. water use reduced from 850,000 to 620,000 gallons per day, 2. BOD5 reduced from 4000 lbs to 1500 lbs per day, 3. BOD5 concentration reduced from 600 to 290 mg/1, 3. grease reduced from 200 to 90 mg/1, 4. elimination of blood from plant effluent, and 5. control of feathers in the plant effluent. (EPA - Corvallis)
W76-08299

ECONOMICS OF IN-PLANT WASTE MANAGEMENT IN FOOD PROCESSING,
Economic Research Service, Washington, D. C. Natural Resource Economics Div.
W. M. Crosswhite.
Presented at Cornell Agricultural Waste Management Conference, February 1, 1972. 15 p, 3 fig, 4 tab, 9 ref.

Descriptors: *Food processing industry, *Waste water treatment, *Economic feasibility, Industrial wastes, *Water reuse, Waste treatment, Treatment facilities, Pollution taxes(Charges), Management, North Carolina.
Identifiers: *Poultry processing wastes, *Waste reduction, In-plant changes, Waste recovery, Waste management.

A case history of a project conducted at the Gold Kist, Inc., Durham, North Carolina poultry processing plant is presented. Results are described of water use and waste load reduction measures and the economic analysis of such reductions. Changes made to reduce water use were: 1. installation of distribution nozzles and body-control valves, 2. use of recirculated offal water in the feather flow-away system, 3. intermittent flow of water on sides of eviscerating trough, 4. flow regulation and control, 5. installation of water meters and pressure regulating valves, and 6. where possible, the flow rates of individual outlets were set by a fixed valve and handles removed. Expected results include reduction of water use from 12 to 7.8 gallons per bird, BOD5 from 560 to 200 mg/1, and grease from 200 to 20 mg/1. Economic feasibility studies show that 1. Without a surcharge: The improved blood recovery, new clean-up process and methods for reducing water use are expected to increase net revenue. Other waste recovery oriented methods such as the floatation unit would not increase net revenue. 2. With a surcharge: All of the process and equipment changes developed in the project increase net revenue and are economically feasible. (EPA - Corvallis)
W76-08300

OCEAN THERMAL ENERGY CONVERSION.
For primary bibliographic entry see Field 8C.
W76-08366

REMOVAL OF HEAVY METAL IONS FROM WASTEWATER,
Department of Agriculture, Washington, D. C. Office of the Secretary. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08402

WATER AND WASTE MANAGEMENT IN POULTRY PROCESSING,
North Carolina State Univ., Raleigh. Dept. of Economics.
W. M. Crosswhite, R. E. Carawan, and J. A. Macon.
In: Proceedings, 2nd National Symposium on Food Processing Wastes, March 23-26, 1971, p 323-335. 4 fig, 4 tab. Denver, Colorado. (EPA Water Pollution Control Research Series 12060---03/71).

Descriptors: *Food processing industry, *Waste water treatment, Industrial wastes, Poultry, Water reuse, North Carolina.
Identifiers: *Poultry processing wastes, *Waste reduction, In-plant changes, Blood recovery.

Benchmark information is given on water and waste quantities, waste water characteristics and biological characteristics of both the product and water at selected points throughout the Gold Kist, Inc., Durham, NC poultry processing plant. Areas of water use reduction are defined and consist of 1. evisceration, 2. scalding and defeathering, and 3. cleanup. Changes made in these areas include use of improved nozzles, use of eviscerating flume water for fresh water in scalding and defeathering, use of chiller water in scalder, and use of high-pressure cleaning systems with foam. Waste reduction measures included use of an improved blood recovery system and the use of stunners prior to killing to reduce body action. Results are 1. water use reduced from 850,000 to 620,000 gallons per day, 2. BOD5 reduced from 4000 lbs to 1500 lbs per day, 3. BOD5 concentration reduced from 600 to 290 mg/l, 3. grease reduced from 200 to 90 mg/l, 4. elimination of blood from plant effluent, and 5. feathers in the plant effluent have been controlled. (EPA - Corvallis)
W76-08428

RECOVERY AND SEPARATION OF CHEMICALS PRODUCED DURING KRAFT PULPING OPERATIONS,
Scott Paper Co., Philadelphia, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08467

PROCESS FOR THE ELECTROLYTIC RECLAMATION OF SPENT ETCHING FLUIDS,
Electrodics, Inc., Philadelphia, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08471

TREATMENT OF PHOTOGRAPHIC FERROCYANIDE-TYPE BLEACH SOLUTIONS FOR REUSE AND DISPOSAL,
Computerized Pollution Abatement Corp., Leicester, N. Y.
For primary bibliographic entry see Field 5D.
W76-08472

CRUDE SOAP RECOVERS MERCURY FROM WATER,
For primary bibliographic entry see Field 5D.
W76-08474

ELIMINATION METHOD FOR MERCURY RESIDUE IN WATER (SUICHU YOZON SUIGIN NO JOKYOHO),
For primary bibliographic entry see Field 5D.
W76-08476

PICKLING WITH HYDROGEN PEROXIDE SOLUTIONS,
For primary bibliographic entry see Field 5D.
W76-08479

WATER TREATMENT SYSTEM SAVES 45,000 GALS DAILY.
For primary bibliographic entry see Field 5D.
W76-08480

POLLUTION PROBLEM SOLVER,
Chrysler Corp. Syracuse, N. Y. New Process Gear Div.
For primary bibliographic entry see Field 5D.
W76-08483

IMS-GRANGCOLD PELLETIZING SYSTEM FOR STEEL MILL WASTES MATERIAL,
International Mill Service, Philadelphia, Pennsylvania.
For primary bibliographic entry see Field 5D.

W76-08491

METALLIC RECOVERY SYSTEM,
Air Preheater Co., Inc., Wellsville, N. Y. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08493

SOUR WATER TREATMENT PROCESS.
For primary bibliographic entry see Field 5D.
W76-08496

RAPSON IDEA SET FOR MILL TRIALS.
For primary bibliographic entry see Field 5D.
W76-08500

IRRIGATION SYSTEM MANAGEMENT FOR REDUCING PEAK ELECTRICAL DEMANDS,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 3F.
W76-08549

RESOURCE RECOVERY: POSSIBILITIES AND PITFALLS,
International City Management Association, Washington, D.C. Management Development Center.
For primary bibliographic entry see Field 5D.
W76-08692

REFUSE INTO POWER,
Louisville Univ., Ky. Dept. of civil Engineering.
For primary bibliographic entry see Field 5D.
W76-08693

PAPER MAKING WASTE-WATER PURIFICATION.
For primary bibliographic entry see Field 5D.
W76-08695

THE LONG HARD ROAD TO THE EFFLUENT-FREE PULP MILL,
For primary bibliographic entry see Field 5D.
W76-08698

THE EFFLUENT TREATMENT SYSTEM AND UTILIZATION OF RECYCLED WATER IN THE IYOMISHIMA MILL (DAIO SEISHI MISHIMA KOJO NI OKERU SOGO HAISUI SHORI TO HAISUI NO SAIRIYO),
For primary bibliographic entry see Field 5D.
W76-08700

RECYCLING--EXAMPLES FOR ITS POSSIBILITIES AND LIMITS (RECYCLING--BEISPIELE FUER MOEGLICHKEITEN UND GRENZEN),
For primary bibliographic entry see Field 5D.
W76-08701

CHEMICAL CLARIFICATION OF WASTE WATER.
For primary bibliographic entry see Field 5D.
W76-08702

THE EFFECTIVE MANAGEMENT OF WASTE.
For primary bibliographic entry see Field 5D.
W76-08704

THE ELECTROLYTIC PROCESSING OF CYANIDE WASTES,
For primary bibliographic entry see Field 5D.
W76-08706

STUDIES CONCERNING OIL REMOVAL FROM MILL SCALE (UNTERSUCHUNGEN ZUR ENTOELUNG VON WALZZUNDER),
For primary bibliographic entry see Field 5D.
W76-08707

INDUSTRIAL WASTE TREATMENT SYSTEM REDUCES POLLUTION,
Sherwood Medical Industries, Inc., Waterbury, Conn.
For primary bibliographic entry see Field 5D.
W76-08711

TREATMENT OF DYE WASTES WITH GRANULAR ACTIVATED CARBON,
ICI United States, Inc. Wilmington, Del.
For primary bibliographic entry see Field 5D.
W76-08716

A MODIFIED RAW-WOOL SCOURING SYSTEM FOR EASIER EFFLUENT TREATMENT,
Commonwealth Scientific and Industrial Research Organization, Belmont (Australia). Div. of Textile Industry.
For primary bibliographic entry see Field 5D.
W76-08717

CANTON'S FUTURISTIC WASTE TREATMENT SYSTEM,
For primary bibliographic entry see Field 5D.
W76-08720

RE-USE AND DISPOSAL OF WASTE ACIDS,
Hoeschst A. G., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5D.
W76-08721

3F. Conservation In Agriculture

IRRIGATION SIGNALLING DEVICE,
E. W. McCloskey.
U.S. Patent No. 3,941,078, 3 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 135, March 2, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, Irrigation ditches, Irrigation systems, Irrigation efficiency, Floating, Equipment.
Identifiers: Signals.

An irrigation device which will signal the presence of water while water is flowing through the ditch, or which may be arranged to indicate that water has flowed through the ditch is described. The device has a body which has a lower portion which projects downward a distance below the bottom of the ditch in order to form a well in which the signal float is positioned. When the well is filled with water from the irrigation water flowing through the ditch, the float will be raised a considerable distance to give an adequate visual signal. The irrigation signal has a removable plug at the lower end of the body so that when the plug is in place irrigation water will be retained in the body and keep the float in a signalling position. When the plug is removed, the water will drain from the lower end of the body so that the signally float will be in signally position only when there is water in the irrigation ditch. (Sinha - OEIS)
W76-08196

ADJUSTABLE SOAKER HOSE SUPPORT ASSEMBLY,
K. E. Bradshaw.
U.S. Patent No. 3,941,342, 4 p, 12 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 224, March 2, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Irrigation operation and maintenance, Application equipment.
Identifiers: *Soaker irrigation.

Adjustable soaker hose support assemblies that are driven or forced into the earth in spaced relationship adjacent an area that is to be water are described. A soaker hose having a number of longitudinally spaced water discharge openings is secured to the assemblies. The assemblies so support the soaker hose, that both the hose and discharge openings may be manually adjusted to permit an area to be watered and then subsequently other areas. Upon completion of the watering operation the soaker hose is easily separated from the assemblies and the assemblies pulled from the earth and stored with the soaker hose until again needed. The assemblies are formed by conventional molding operations from a high impact polymercized resin. The assemblies may be supported in hard packed earth by being driven by hammer blows applied to the tops of the assemblies. (Sinha - OEIS)
W76-08197

SOIL MOISTURE REGIME AND PIGMENT CONTENT IN LEAVES OF CEREALS, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Insr. of Experimental Botany.
L. P. Smolyak, U. H. Reutski, Zh. I. Kazlova, and L. S. Sazonava.
Vyestsi Akad Navuk Bssr Syer Biyal Navuk 5, p 41-47, 1974.

Descriptors: *Soil moisture, Moisture content, *Leaves, Cereal crops.
Identifiers: *Pigment content(Leaves).

The maximum concentration of leaf pigments was noted in plots where the upper boundary of the transitional zone of the capillary fringe was at the soil surface. It is concluded that the groundwater level resulting in this position of the capillary fringe should be considered optimal.--Copyright 1975, Biological Abstracts, Inc.
W76-08304

CHANGE OF THE CONTENT AND STATE OF PIGMENTS IN LEAVES OF MALE AND FEMALE HEMP IN RELATION TO NUTRITION AND SOIL MOISTURE CONTENT, (IN RUSSIAN),
Kabardino-Balkarski Gosudarstvennyi Universitet, Nalchik (USSR).
For primary bibliographic entry see Field 2I.
W76-08306

CARBOHYDRATE TRANSFORMATION IN WHEAT AND RYE PLANTS UNDER EFFECT OF FLOODING IN THE AUTUMN-WINTER PERIOD, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
E. D. Ostaplyuk, L. L. Kurochkina, and V. E. Semenyuk.
Fiziol Biokhim Kul't Rast. 7(1), p 13-17, 1975.

Descriptors: *Wheat, *Carbohydrates, *Rye, Seeds, *Flooding, Seasonal, Crop response, Freezing.
Identifiers: Ethanol, Glycolysis, Lactate, Pyruvate, Saccharides, Winter wheat.

Excessive moistening and flooding of winter wheat and rye seedlings induced an increase in the glycolysis intensity in the tillering nodes, which is evidenced by accumulation of pyruvate, lactate and ethanol. At the end of autumn growth and at the beginning of winter, alongside the accelerated expenditure of monosaccharides, there occurs rapid hydrolysis of oligo-and polysaccharides in the flooded plants. Analogous transformations of reserve carbohydrates take place with the freezing

of plants into ice.--Copyright 1976, Biological Abstracts, Inc.
W76-08307

SALT AND WATER BALANCE IN IMPERIAL VALLEY, CALIFORNIA,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 3C.
W76-08331

GROUND TREATMENT APPARATUS,
A. N. Ede.
U. S. Patent No. 3,942,722, 10 p, 35 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 2, p 725, March 9, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation systems, *Sprinkler irrigation, Irrigation effects, Irrigation efficienty, Water delivery, Lateral conveyance structures.
Identifiers: Booms, Movable vehicles.

Irrigation apparatus is comprised of a movable vehicle arranged to be steered along a required ground path and carrying a pair of laterally-extending booms each of which is pivoted to one side of a rotatable turret mounted on the vehicle chassis. Each boom carries spray or sprinkler nozzles paced along their lengths and one or more spray nozzles at its tip, all connected to a supply of water. The spray patterns of the various nozzles overlap one another in such a way as to ensure even total dosage of water delivered per unit area of ground as the machine advances. The turret and booms can be angularly reciprocated about the vertical axis of the turret. The vehicle may be connected by a trailing flexible hose pipe to a hydrant, or may have a power-driven hose reel on which the hose is wound and by which it can be reeled in or unreeled while the vehicle is moving and with the hose either empty or delivering water. The flexible hose may be of a longitudinally-seamed construction. (Sinha-OEIS)
W76-08393

IRRIGATION SYSTEM (LIFTING DOGS),
R. D. Boone.
U. S. Patent No. 3,943,966, 5 p, 11 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1190, March 16, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, Sprinkler irrigation, Pipes, Water distribution(Applied), Application equipment.

An agricultural irrigation system has an elongated pipe adapted to carry sprinklers mounted on it. Water is supplied to the pipe under pressure. A number of vehicles support the pipe and each vehicle has an improved means for driving it. Two reciprocating cables are mounted on the pipe. One cable extends around a pulley at the end of the pipe and the other extends back to the power means. Alternate vehicles are attached to one or the other cables. At each vehicle the cable acts to both align the vehicle and power it through a 'joy stick' attached. Reciprocating motion of the 'joy stick' powers the vehicle and tilting motion aligns it. The alignment is accomplished by lifting the dog from a ratchet wheel. (Sinha-OEIS)
W76-08398

MOISTURIZING APPARATUS FOR USE WITH WIND MACHINES,
SSP Agricultural Equipment, Inc., Burbank, Calif. (Assignee).
D. E. Butler.
U. S. Patent No. 3,944,139, 4 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1248, March 16, 1976.

Descriptors: *Patents, *Humidity, *Mist, *Moisture, Agriculture, *Water utilization, Citrus fruits, Crops, *Mist irrigation.
Identifiers: Wind machines.

Moisturizing apparatus is adapted for use with conventional agricultural wind machines which at the present time are utilized by many large citrus groves for winter frost protection. The wind machines include a base set in the ground with a tower rising vertically to an elevation well above the trees. A power means is employed to rotate a fan blade at the top of the tower and air is drawn through the blade and spirally forced over the trees creating a disturbance of the ambient air preventing cold air to settle. The object of this invention is to provide a moisturizing means to force water into the air stream and force water-ladened air over the citrus trees to humidify the hot dry air which causes 'June Drop' of citrus buds. The invention includes an annular water manifold secured on top of the wind machine tower with a water supply means connected to the manifold. (Sinha-OEIS)
W76-08399

UNDERGROUND IRRIGATION SYSTEM,
E. J. Green.
U. S. Patent No. 3,946,762, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2262, March 30, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Subsurface irrigation, *Irrigation efficiency, Irrigation practices, Pipes, Conduits, Flow, Subsurface drainage.

An irrigation or drainage system is comprised of one or more conduits having radially positioned spaced apertures in the walls. The system is otherwise closed except for an inlet/outlet aperture. The exterior of the conduits is covered by a snugly fitting fine mesh fabric sheath which covers all of the radial apertures, the interstices in the mesh of the fabric being very small and uniformly distributed so that fluid under slight to moderate pressure will flow through the sheath at least partially as the result of capillary action, and fluid distribution will be uniform throughout the length of the fabric sheath and about the periphery of the conduit. The conduits and fabric are composed of material resistant to the action of soil salts and irrigating fluids. The system works equally well in reverse direction so that it can also be used as a drainage system. (Sinha - OEIS)
W76-08406

SELF PROPELLED SPRINKLING IRRIGATION APPARATUS,
Gifford-Hill and Co., Inc., Dallas, Tex. (Assignee).
J. E. Hansen, and J. L. Jackson.
U. S. Patent No. 3,946, 946, 6 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2323, March 30, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, Conveyance structures, Sprinkler irrigation, Water conveyance.

A self propelled sprinkling irrigation apparatus includes an elongated pipe line for transporting water with a number of interconnected pipe spans each having sprinkler mechanisms for distribution of the water. A pairof tension elements are connected adjacent the extremities of each pipe span. Load supporting elements are spaced along each of the pipe spans and are interposed between the pipe and the tension elements. A transverse brace is interposed between each of the pairs of load supporting elements and maintains the load supporting elements in stabilized diverging relation. A single stabilizer brace element extends between the pipe span and one of the tension elements. The stabilizer elements cooperating with successive pairs of the load carrying elements are connected to opposite ones of the tension elements. The stabilizer elements are placed in alternating directly connected relation with one of the load carrying elements of each pair of load carrying elements. The other load carrying element of each pair is indirectly but positively supported in space by support forces transmitted through the tension element. (Sinha - OEIS)
W76-08407

STUDY OF SELF-DIFFUSION OF WATER AND ITS ACTIVATION ENERGY IN CELLS OF DIFFERENT PLANT TISSUES, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
For primary bibliographic entry see Field 2I.
W76-08429

ECONOMIC EVALUATION OF PROPOSED WATER CONSERVATION PRACTICES ON ESTABLISHED IRRIGATION DISTRICTS: A GENERAL METHODOLOGY AND APPLICATION TO THREE DISTRICTS IN OREGON,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
F. S. Conklin, and W. E. Schmisseur.
Report prepared for Engineering and Research Center, Bureau of Reclamation, Denver, Colorado, May 1976. 109 p, 4 fig, 46 tab. BuRec 14-06-D-6808.

Descriptors: *Water conservation, *Irrigation districts, Methodology, *Evaluation, *Oregon, Estimating, Irrigation water, Water policy, *Algorithms, Income, *Water allocation(Policy), Investment, Alternative water use, Sprinkler irrigation, Crop production, Water storage, Water rates, Economics.
Identifiers: Economic models.

This study develops a quantitative framework to estimate economic effects from use of selected policy choices for conserving irrigation water. The framework is designed specifically to evaluate expected benefits of rehabilitation and betterment proposals submitted by established irrigation districts to the Bureau of Reclamation. District specific technical and economic relationships were modeled using a linear programming algorithm. District incomes, an aggregation of farmer returns above operating costs, were maximized with selected policy choices and compared against base, or 'as is' conditions. District water storage, pumping, and flow characteristics were resource restraints, while crops and selected irrigation technologies were activities. Five water conservation choices were evaluated: (1) capital investment in district main canal lining, (2) implementation of a district stored water holdover right, (3) expansion of district irrigable acreage, (4) modification of water charges paid by growers, and (5) on-farm conversion from flood to sprinkler irrigation. Water conservation choices for the North Unit, Stanfield, and Owyhee Irrigation Districts in Oregon were evaluated. Values of specific water conservation practices were a function of geographic, climatic, edaphic, institutional, legal, and operating conditions unique to each district. (Bureau of Reclamation)
W76-08431

AN OPTIMIZATION TECHNIQUE ADAPTED TO USDAHL-74 REVISED MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W76-08523

SOIL LOSS FROM ILLINOIS FARMS - ECONOMIC ANALYSIS OF PRODUCTIVITY LOSS AND SEDIMENTATION DAMAGE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4D.
W76-08533

NITROGEN CONSERVATION UNDER CORN PLANTED IN QUACKGRASS SOD,
Agricultural Research Service, Morgantown, W. Va.
O. L. Bennett, G. Stanford, E. L. Mathias, and P. E. Lundberg.
Journal of Environmental Quality, Vol. 4, No. 1, p 107-110, January-March 1975. 3 fig, 4 tab, 18 ref.

Descriptors: *Fertilization, Fertilizers, *Grasses, *Nitrogen, Crop response, *Corn(Field), Crop production.
Identifiers: *Atrazine, *Silage yields, *Quackgrass sod.

The mechanics of growing corn in a grass sod using the no-tillage concept have recently been developed. However, little is known about the fate of fertilizers, especially nitrogen, or the potential uses of such plant species as quackgrass in this management system. Silage yields of corn were determined from field studies in which corn sod-planted in quackgrass, treated with six rates of atrazine, was compared to conventionally planted corn. The effects of no tillage and conventional tillage, using two rates of atrazine on total soil N, and N mineralization potential were compared. Yields of corn silage produced in herbicide-treated quackgrass were significantly higher than yields from conventional tillage. In the first year, silage yields increased with rates of atrazine. Quackgrass persisted for a 2-year period at the three lowest rates of atrazine but not at higher rates. After the first season, mineral N (largely NO(3)-N) was significantly greater under untilled quackgrass than under plowed plots. However, by the following spring differences associated with tillage method had disappeared. Soil N mineralization potential, NO, and total N in the 0- to 15-cm layer were considerably higher for untilled than for plowed soils. However, in untilled plots, these values were unaffected by rate of atrazine. (Skogerboe-Colorado State)
W76-08541

LIMITED IRRIGATION OF GRAIN SORGHUM IN ALTERNATING STRIPS WITH WHEAT,
Southwestern Great Plains Research Center, Bushland, Tex.
J. T. Musick, and D. A. Dusek.
Transactions of the ASAE American Society of Agricultural Engineers, Vol. 18, No. 3, p 544-548, May-June 1975. 5 fig, 3 tab, 12 ref.

Descriptors: *Sorghum, *Wheat, Irrigation, Irrigation practices, Furrow irrigation, Surface irrigation, Irrigation effects, Crop response, Crop production, Great Plains.

Grain sorghum and winter wheat are the two major irrigated crops in the Southern High Plains. In 1973, irrigated grain sorghum was grown on 863 200 ha and irrigated winter wheat on 486 000 ha. Declining groundwater tables and well yields necessitate conservation and efficient use of limited irrigation water supplies. Management practices are needed for reducing water application in furrow irrigated systems. Results are reported from the grain sorghum phase of a 6-yr field study in which grain sorghum and winter wheat were grown in alternating 4.56-m wide drill strips. (Skogerboe-Colorado State)
W76-08542

DEEP TILLAGE OF GRADED-FURROW-IRRIGATED PULLMAN CLAY LOAM,
Southwestern Great Plains Research Center, Bushland, Tex.
J. T. Musick, and D. A. Dusek.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 2, p 263-269, March-April 1975. 9 fig, 3 tab, 14 ref.

Descriptors: Soil environment, Soil investigations, *Soil management, *Soil properties, Soil texture, Crop response, Surface irrigation, Irrigation, Furrow irrigation, Loam, *Cultivation, Clays.
Identifiers: *Tillage depth.

Pullman clay loam was deep tilled with a large moldboard plow to 40, 60, and 80 cm in 1966 at the USDA Southwestern Great Plains Research Center, Bushland, Texas. Deep tillage was compared with 20-cm normal tillage depth. The deep tillage treatments partially or completely penetrated slowly permeable clay Bt horizons that extended to about the 60-cm depth and partially mixed the clay Bt with the more permeable clay loam surface A horizon. The long-term effects were evaluated during the production of nine crops over a 7-yr. period. The major effects on increasing water intake and yields under limited irrigation were obtained from increasing tillage depth from 20 to 40 cm. Increasing tillage depth to 60 and 80 cm, which completely penetrated the slowly permeable clay Bt horizon, had a smaller additional effect on water intake and little or no additional effect on yields. (Skogerboe-Colorado State)
W76-08543

IRRIGATING CORN AND GRAIN SORGHUM WITH A DEFICIENT WATER SUPPLY,
California Univ., Davis. Dept. of Water Science and Engineering.
J. I. Stewart, R. D. Misra, W. O. Pruitt, and R. M. Hagan.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 2, p 270-280, March-April 1975. 7 fig, 8 tab, 15 ref.

Descriptors: *Corn, *Sorghum, *Irrigation, *Irrigation effects, *Irrigation practices, Crop response, Evapotranspiration, *Crop production, Water supply.

Maximizing crop production with limited irrigation water requires quantitative information about differential yield responses to given levels of water deficit in each major growth period. Corn grain yield is especially vulnerable to water deficits during the pollination period, provided the crop has experienced little or no ET deficit in the late vegetative period, ending at first tassel. However, the susceptibility of corn yield to deficits in the pollination period is greatly lessened if there have been prior deficits. This is expressed as a 'conditioning' factor which is important to the planning of irrigation programs which, either by choice or by exigencies of water supply, include evapotranspiration (ET) deficits during one or more major growth periods. Grain sorghum yield is markedly less sensitive to ET deficits than corn, and there is no indication that a conditioning factor operates with this crop. The yield reduction ratios found for the two crops are summarized. (Skogerboe-Colorado State)
W76-08544

DRAIN ENVELOPE RESPONSE TO FIELD TREATMENTS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 4A.
W76-08548

IRRIGATION SYSTEM MANAGEMENT FOR REDUCING PEAK ELECTRICAL DEMANDS,
Agricultural Research Service, Lincoln, Nebr.
L. E. Stetson, D. G. Watts, F. C. Corey, and I. D. Nelson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 2, p 303-306, 311, March-April 1975. 3 fig, 1 tab, 9 ref.

Descriptors: *Electric power demand, *Irrigation operation and management, Irrigation effects, Nebraska, Irrigation, Agriculture, Energy, Demand, Water management(Applied).

Peak summer power demand and the ratio of summer to winter loads limit electric energy for irrigation in Nebraska. An experiment conducted to schedule operation of irrigation systems during hours of lower electrical demand showed that peak summer demand loads can be reduced. The peak electrical demand of a power district was reduced, but crop yields were not. The scheduled irrigation systems used less total energy and water. Power districts and irrigators are expected to use results of this experiment either to increase the area irrigated or to reduce future energy and water demands. (Skogerboe-Colorado State)
W76-08549

PLANNING IRRIGATION AND DRAINAGE SYSTEMS USING RETENTION AND EXTRACTION LIMITS,
Bureau of Reclamation, Denver, Colo.
M. D. Campbell, and W. D. Lembke.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 3, p 514-517, May-June 1975. 8 fig, 15 ref.

Descriptors: *Irrigation, *Drainage, *Planning, Irrigation engineering, Drainage engineering, Model studies.

Rather than explaining that water held in the soil between field capacity and the wilting percentage is available for plant growth and then trying to define field capacity and wilting percentage to suit needs, two new range limits are defined and the use of these limits to provide for efficient use of water and maximum plant growth is illustrated. Data reported by Denmead and Shaw (1962) and a model developed by Campbell (1972) were used to display the ideas associated with these limits. (Skogerboe-Colorado State)
W76-08553

RELATION BETWEEN PLANT TRANSPIRATION AND METABOLISM, (IN RUSSIAN),
Tashkent Agricultural Academy (USSR).
For primary bibliographic entry see Field 2D.
W76-08583

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
For primary bibliographic entry see Field 2D.
W76-08585

RESISTANCE-ENERGY BALANCE METHOD FOR PREDICTING EVAPOTRANSPIRATION: DETERMINATION OF BOUNDARY LAYER RESISTANCE AND EVALUATION OF ERROR EFFECTS,
For primary bibliographic entry see Field 2D.
W76-08586

AN EVALUATION OF A RESISTANCE FORM OF THE ENERGY BALANCE TO ESTIMATE EVAPOTRANSPIRATION,
For primary bibliographic entry see Field 2D.
W76-08587

RESISTANCE-MASS TRANSFER METHOD FOR ESTIMATING EVAPOTRANSPIRATION: COMPARISON WITH LYSIMETRIC MEASUREMENTS IN IRRIGATED SORGHUM,
For primary bibliographic entry see Field 2D.
W76-08588

COMPARISON OF A MODIFIED BROWN-ROSENBERG RESISTANCE MODEL WITH OTHER EVAPOTRANSPIRATION ESTIMATION METHODS: TESTS IN AN IRRIGATED SORGHUM FIELD,
For primary bibliographic entry see Field 2D.
W76-08589

CANOPY TEMPERATURE MEASUREMENT OF SORGHUM AND MILLET WITH LEAF THERMOCOUPLE AND INFRARED THERMOMETER TECHNIQUES,
For primary bibliographic entry see Field 2D.
W76-08590

NATURAL AND AGRICULTURAL ECOSYSTEMS,
Tasmanian Coll. of Advanced Education, Launceston.
For primary bibliographic entry see Field 6G.
W76-08667

OUTFLOW FROM VARIOUS SUBSURFACE DRAINAGE MATERIALS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 4A.
W76-08669

NITRATE, PHOSPHATE, AND POTASSIUM MOVEMENT INTO DRAINAGE LINES UNDER THREE SOIL MANAGEMENT SYSTEMS,
Florida Univ., Fort Pierce. Inst. of Food and Agricultural Science.
For primary bibliographic entry see Field 5B.
W76-08680

GRAPHIC DETERMINATION OF SUB-MAIN PIPE SIZE FOR SOLID-SET SPRINKLER IRRIGATION ON STEEP, NON-UNIFORM SLOPES,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
W. R. DeTar.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 3, p 503-504, 507, May-June 1975. 3 fig, 1 tab, 1 ref.

Descriptors: *Sprinkler irrigation, *Irrigation, *Irrigation engineering, *Hydraulic design, Hydraulics, Slopes, Piping systems,(Mechanical), Pipes.
Identifiers: *Pipe size.

Analytical solutions to the problem of selecting the proper size for sub-main descending steep, irregular slopes for solid-set irrigation systems can be tedious. A simple graphical method is presented here for obtaining fairly uniform pressures along the sub-main. The method is particularly useful for any solid-set system that repeatedly uses the same lateral size and spacing. (Skogerboe-Colorado State)
W76-08682

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

IDENTIFICATION, MEASUREMENT, AND INCORPORATION OF ENVIRONMENTAL QUALITY OBJECTIVES IN NATURAL RESOURCE DEVELOPMENT,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-08101

EFFICIENT RESOURCE UTILIZATION WITHIN A REGIONAL FRAMEWORK.
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-08102

MULTIPLE USE EVALUATIONS ON PONDEROSA PINE FOREST LAND,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
M. B. Baker, Jr., and H. E. Brown.
In: 18th Annual Arizona Watershed Symposium Proceedings, Phoenix, September 25, 1974, Report No. 6, p. 18-25. 9 fig, 1 tab.

Descriptors: Water yield improvement, *Forest managment, *Multiple purpose, *Ponderosa pine trees, *Arizona.
Identifiers: Beaver Creek Project(Ariz), Salt-Verde River Basin(Ariz).

Principal resource responses resulting from manipulating ponderosa pine forests growing on volcanic soils, such as water yield, timber volume, understory plant production and forage for wildlife are cited. Four major areas are described in which additional knowledge is needed: (1) ecological relationships in growing ponderosa pine on sedimentary-derived soils; (2) transmission losses between source of water increase and storage; (3) effect of vegetative manipulations on sediment yield, pine regeneration, wildlife use, recreation and esthetics; (4) detailed inventory of pine type to determine its acreage by stand density, soil type, precipitation amount and other factors. (Forest Service)
W76-08109

PINYON-JUNIPER CONTROL--DOES IT PAY,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary.
In: 18th Annual Arizona Watershed Symposium Proceedings, Phoenix, September 25, 1974, p 26-29. Report No. 6.

Descriptors: *Ponderosa pine trees, *Juniper trees, *Arizona, *Water yield improvement, Forest management, *Multiple purpose, Watershed management costs.
Identifiers: Utah juniper, Alligator juniper,Verde and Salt River Basins(Ariz), Beaver Creek watershed(Ariz).

Current results of water yield improvement tests in the pinyon-juniper type are examined in light of their impacts on multiple uses of the land. The changes in values are considered in relation to management costs. Results obtained on the Beaver Creek watershed, Coconino National Forest, are emphasized because considerable multiple use information has been developed there. Results from studies of related areas such as Corduroy Creek and Cibecue Ridge are utilized in formulating the conclusions for this vegetation type. Research needs also are described. (Forest Service)
W76-08110

ON-SITE RUNOFF DEPLETION AT THREE IMPOUNDMENTS,
Agricultural Research Service, Chickasha, Okla.
R. R. Schoof, and J. W. Naney.
Journal of Soil and Water Conservation, Vol. 31, No. 2, p 67-70, March-April 1976. 2 fig, 4 tab, 5 ref.

Descriptors: *Runoff, *Impoundments, *Oklahoma, *Evaporation, *Seepage, Sandstones, Channels, Floodwater, Irrigation wells, Groundwater, Withdrawal, Water storage, Hydrologic budget, Water loss, Precipitation(Atmospheric), Evapotranspiration.
Identifiers: Caddo County(Okla), Runoff depletion, Soil Conservation Service, Depletion rates, Floodwater-retarding impoundments, *Sugar Creek watershed(Okla).

On-site flow depletions for three floodwater-retarding impoundments, constructed by the Soil Conservation Service on Sugar Creek in Caddo County, Oklahoma, were analyzed. Annual evaporation and seepage varied from 52 to 103 inches. The higher depletion rates were associated with an impoundment located on a sandy valley floor. A pervious sandstone abutted the dam on both ends, and two irrigation wells were located nearby. Measured seepage from one of the impoundments accounted for 15.6% of the combined seepage and evaporation. About one-third of this seepage reappeared in the down-stream channel. The other two impoundments had more long-term storage of groundwater and less return flow to the channel. Analysis of the water budgets for the three floodwater-retarding impoundments indicated that little water flowed past the structures in years with less-than-normal precipitation. Runoff depletion at the three sites was similar to that for floodwater-retarding impoundments in Texas and Oklahoma. (Roberts - ISWS)
W76-08122

SNOWMELT-RUNOFF MODEL FOR STREAM FLOW FORECASTS,
Eidgenoessische Institut fuer Schneeund Lawinenforschung, Davos (Switzerland).
For primary bibliographic entry see Field 2E.
W76-08131

LAND USE AND WATER QUALITY IN NEW YORK RIVERS,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08133

EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7C.
W76-08147

ECONOMIC CONCEPTS AND TECHNIQUES PERTAINING TO WATER SUPPLY, WATER ALLOCATION, AND WATER QUALITY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08152

WATER SUPPLY.
Institute for Water Resources (Army), Fort Belvoir, Va.
In: 'Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality,' IWR Paper 75-P5, December 1975, Part One. 67 p, 4 fig. DACW31-76-M-0435.

Descriptors: *Planning, *Water supply, *Groundwater, *Reservoir yield, *Economic efficiency, Humid areas, Alternative planning, Water demand, Conjunctive use, Methodology, Design flow, Water shortage, Risks, Water costs, Maintenance costs, Operating costs, Industries.

The role that groundwater should be accorded in future allocations of surface water storage for water supply is examined and quantified, based on a description of a generalized water supply system. Methodologies are provided for determining the least-cost water supply alternative, and subsidiary system design considerations; and for estimating, for any given water demand center, the economically most efficient development schedule and management regimen for surface and groundwater resources. Details are given for planning for a surface water supply based on demand estimates, decision functions, sizing water supply, and reservoir operation. Procedures for joint ground and surface water use are given together with cost indices for construction, operation and maintenance of surface reservoirs for generating approximate costs. Assessment of economic risk of water supply shortages is based on a model of loss functions. The effects of changes in price and water quality, and in water pollution abatement

regulations, on industrial technological changes in process design and plant location decisions are computed by equations based on the level of gross water use, the level of intake water use, the relationship between these two, and the price elasticity of water, thus generating use/cost ratios. (See also W76-08152) (Auen-Wisconsin)
W76-08153

WATER ALLOCATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08154

LAND-USE MODEL FOR SERVICE AREA PROJECTION,
Brookhaven National Lab., Upton, New York, Dept. of Applied Science.
For primary bibliographic entry see Field 5G.
W76-08226

REASSESSMENT OF THE CROSS-FLORIDA BARGE CANAL: A PROBABILITY APPROACH,
California Univ., Santa Barbara. Dept. of Economics.
L. J. Mercer, and W. D. Morgan.
Journal of Environmental Economics and Management, Vol. 2, No. 3, p 196-206, February 1976. 2 fig, 6 tab, 17 ref. OWRT A-053-CAL(2)

Descriptors: *Canals, *Assessment, *Probability, *Cost-benefit analysis, Projects, Discount rates, Environment, Planning, Decision making, Cost-benefit ratio, Recreation, Transportation, Operation and Maintenance, Systems analysis, Risks.
Identifiers: *Cross-Florida Canal, *Weibull distribution, Sensitivity analysis.

This reassessment of the Corps of Engineers' study of the Cross-Florida Canal demonstrates the application of the Weibull probability distribution to handle uncertainty in benefit-cost analysis and illustrates the distribution's use to incorporate environmental considerations in project analysis. With range and probability assumptions to reflect the criticisms of the Corps' study, it is shown that the Canal was a high-risk project even with the inappropriately low discount rate used. Use of the Weibull distribution is shown to be superior to the usual point estimates and range sensitivity tests in benefit-cost analysis. (Bell-Cornell)
W76-08228

MEASURING WATERSHED LAND-USE CHANGES WITH AIRPHOTOS,
Clemson Univ., S. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-08229

DRAINAGE RUNOFF OF THE GROUNDWATER UNSTEADY FLOW TO THE DRAINS (DRENAZNY ODTOK PRI NEUSTALENOM PRUDENI PODZEMNEJ VODY K DRENOM),
For primary bibliographic entry see Field 4B.
W76-08239

ULTRASONIC RIVER FLOW MEASUREMENT,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 7B.
W76-08241

PUMPS FREE CITY FROM LAKE ERIE FLOODING.
For primary bibliographic entry see Field 8C.
W76-08250

ALTERNATIVE METHODS OF ESTIMATING SNOW WATER PARAMETERS,
Idaho Univ., Kimberly. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W76-08259

THE RELATIONSHIP BETWEEN WATERSHED USE AND STREAM WATER QUALITY,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 4D.
W76-08282

THE EFFECT OF FOREST STANDS ON THE WATER CONTENT OF ROCKS OF THE LOESS COVER IN THE WESTERN REGIONS OF THE NORTHERN BLACK SEA AREA, (IN UKRANIAN),
USSR Akademiya Nauk URSR, Kiev. Instytut Geologichnykh Nauk.
V. F. Krayev, and V. S. Lyukshyn.
Dopov Akad Nauk Ukr Rsr Ser B Heol Heofiz Khim Biol 3, p 210-213, 1975.

Descriptors: *Forests, *Loess, *Water supply, Watersheds(Basins), Soil types, Moisture content.
Identifiers: *Black Sea Area, *USSR(Ukranian SSR).

The water supply of the loess cover rocks in the western regions of the Northern Black Sea area (Ukrainia, SSR, USSR) is determined not only by the regional peculiarities of its geological structure but also by the local forest stands. In the watershed plane areas loess of the Knieper horizon underlying the 2nd fossil soil contains water in a zone 150-250 m wide and the Oka loess underlying the 3rd fossil soil in a zone 400-600 m wide on both sides of the forest strips. The optimal density of the forest stand network provides for the formation of water-bearing horizons of continuous distribution.--Copyright 1975, Biological Abstracts, Inc.
W76-08303

EXAMINATION OF THE CONCEPT AND USE OF THE STANDARD PROJECT FLOOD,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 8B.
W76-08321

INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
B. J. Blanchard.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-21770, $6.00 in paper copy, $2.25 in microfiche. Final Report, January 25, 1975. 125 p, 9 fig, 4 tab, 4 ref, 1 append. NASA S-70251-AG.

Descriptors: *Remote sensing, *Flood forecasting, *Runoff, *Oklahoma, *Runoff coefficient, *Land use, *Hydrology, *Rainfall-runoff relationships, Flood data, Flood plain zoning, Watersheds(Basins), Satellites(Artificial), Model studies, Data processing.
Identifiers: *Watershed models, *ERTS data, *Runoff curve number, Watershed characteristics.

Digital data from the ERTS multispectral scanner was used to investigate the feasibility of identifying differences in watershed runoff capability with spaceborne sensors. Linear combinations of the two visible light bands and a combination of the four visible and near infrared bands were related to a coefficient used in the Soil Conservation Service storm runoff equation. Good relationships were found in two scenes, both with dry surface conditions, over the same watersheds. The relationships defined by both combinations of digital data were tested on an independent set of 10 watersheds and on an additional 22 subwatersheds. Coefficients predicted with the ERTS data proved better than coefficients developed with conventional methods. (Terstriep-ISWS)
W76-08326

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY, PART II: NON-CONSERVATIVE SPECIES TRANSPORT MODELS,
Alabama Univ., Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 5B.
W76-08327

HOW MUCH PRECIPITATION GOES TO INFILTRATION DURING A STORM PERIOD,
Karnataka Regional Engineering College, Surathal (India). Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 2A.
W76-08339

DIMENSIONLESS SOLUTION OF DAM-BREAK FLOOD WAVES,
Patras Univ. (Greece). School of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-08343

CHANGE IN YIELD OF WATER FOLLOWING A BUSHFIRE IN A FOREST OF EUCALYPTUS REGNANS,
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 4C.
W76-08349

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, UNIT 2, SAN BENITO, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for San Benito County, June, 1975. 21 p, 12 fig, 21 plates, 6 tab.

Descriptors: *Flood flow, *Flood profiles, *Flood data, *Flood stages, *Flood damage, *Flood forecasting, *Bank erosion, Storms, Flood frequency, Historic floods, Flood peak, Flood frequency, Deposition, Warning systems, Levee, Reservoir, *California, Deposition(Sediments).
Identifiers: San Benito County(Calif), *San Felipe Lake(Calif), Tequisquita Slough(Calif), Santa Ana Creek(Calif), Arroyo de las Viboras(Calif), Arroyo dos Picachos(Calif), Pacheco Creek(Calif), Dunneville(Calif), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

San Felipe Lake, all that remains of an ancient lake bed, receives the waters of Tequisquita Slough, Santa Ana Creek, Arroyo de las Viboras and Arroyo dos Picachos (cumulative drainage area=115 square miles). The very flat flood plains are used for agriculture and have scattered farm buildings and residences. Levees constructed by private interests protect some portions of the study area. No regulatory measures exist for reducing flood damage. An irrigation reservoir located in the headwaters of Arroyo de las Viboras stores 540 acre-feet. Historically, flooding (16 damaging floods since 1909) has occurred from November to April, as the result of prolonged rainfall. Newspaper accounts and the gage on Pacheco Creek near Dunneville indicate that the worst flood on record occurred in December, 1955, when flood elevations reached 251.7 ft and 250 persons were evacuated in Northern San Benito County. Flood elevations at the Pacheco Creek gage could be expected to reach 267 feet and 279 feet during an Intermediate Regional Flood and a Standard Project Flood respectively. Both floods would result in severe streambank erosion(channel velocities during an IRF in Tequisquita Slough=5-10 ft/sec) and the deposition of silt (overbank

velocities during an IRF=2-5 ft/sec). Peak discharge in Tequisquita Slough at San Felipe Lake would reach 16,000 cubic feet per second and 21,000 cfs during an IRF and SPF respectively. (Henley - North Carolina)
W76-08376

FLOOD PLAIN INFORMATION: ALAMO AND ULATIS CREEKS, VACAVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for Solano County, California, June, 1973. 44 p, 22 fig, 16 plates, 6 tab.

Descriptors: *California, *Floods, *Flooding, *Streamflow forecasting, *Flood profiles, *Flood plaines, Flood frequency, Peak discharge, Flood peak, Stream erosion, Deposition(Sediments), Bank erosion, Obstruction to flow, Zoning, Channel improvement.
Identifiers: Alamo Creek(Calif), Ulatis Creek(Calif), Encinosa Creek(Calif), Laguna Creek(Calif), Vacaville(Calif), Standard Project Flood, Intermediate Regional Flood.

Major and minor flooding has occurred in this area, which comprises the flood plains of 4 streams, 12 times between 1937 and 1973. The stream system rises in the Vaca Mountains draining into the Sacramento River. Alamo Creek is a tributary to Ulatis Creek in the lower reaches of the drainage basin. Their flood plains are almost parallel in the study area. Encinosa and Laguna Creek are westside tributaries of Alamo Creek. Some orchards and croplands are interspersed with suburban development adjacent to Vacaville. The estimated 1973 population of 23,000 in the study area is expected to reach 55,000 by the year 2000. No streamflow data has been kept, but hydrologists stated that the 1967 and 1973 floods had a frequency of 25 years. Damage has generally been limited to streambank erosion, deposition of debris, damage to roads, bridges, and crops. Floods caused by heavy rain over a long period of time occur between October and April. In an Intermediate Regional Flood peak flows of 4400 cfs and water velocities of 3 to 8 feet per second are expected in the main channel and from 1 to 4 ft/sec in the overbank area. This flood would rise to peak in 4 hours and the duration of the flood stage would be 7 hours. Eighteen bridges and culverts would obstruct flood flow. In a Standard Project Flood peak flows of 5800 cfs are expected. The time of rise is predicted to be 6 hours and the duration above flood stage 11 hours. Twenty-three bridges and culverts would be obstructive to flood flow. Some channel improvement work has been undertaken by the U.S. Soil Conservation Service upstream from the study area; it is expected to provide protection against a 10-year flood. No other flood control facilities have been proposed. (Smith-North Carolina)
W76-08377

FLOOD PLAIN INFORMATION: EEL RIVER--STAFFORD TO HOLMES, HUMBOLDT COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
Prepared for Humboldt County, California, December, 1970. 35 p, 7 fig, 11 plates, 6 tab.

Descriptors: *Floods, Flooding, *Flood forecasting, *Flood profiles, *Flood data, *Flood damage, *Flood plains, *California, Flood flow, Streamflow forecasting, Maximum probable flood, Historic floods, Flood frequency, Peak discharge, Flood peak, Obstructions to flow, Flood plain zoning.
Identifiers: Stafford(Calif), *Eel River(Calif), Larabee Creek(Calif), Standard Project Flood, Elinor(Calif), Shively(Calif), Pepperwood(Calif), Holmes(Calif), Intermediate Regional Flood.

The flood plains in this study are generally devoted to agricultural production, though the farmland is bordered by giant redwood trees. The Eel River flows through narrow V-shaped canyons through most of its length and debouches into a wide floored delta near its mouth. Floods in the past have generally occurred in the winter, as did the great floods of 1955 and 1964, the latter being almost equivalent to a Standard Project Flood (SPF) with the community of Pepperwood being completely destroyed while Shively and Stafford had only a few buildings left standing. Damages were estimated to be in excess of $5,000,000. During the 1955 flood damages were about $3,500,000. Depths of water ranged up to 20 feet in the study area in 1964. Two gaging stations provided basic hydrologic data. The 1964 flood had a peak discharge of 752,000 cfs and rose in a period of 40 hours. It was 72 feet above the streambed at its maximum. Water velocities ranged from 5 to 16 feet per second. In an Intermediate Regional Flood Eel River at Scotia could rise 56 feet above the streambed in a period of 50 hours; in an SPF a rise of 63 feet in a period of 52 hours is forecasted for same location. Average water velocities in an SPF could be expected to be those of the 1964 flood. The single bridge spanning the Eel River is not expected to be an obstruction in any flood, though the redwood trees are obstructive to flood flows. Flood plain ordinances have been adopted by Humboldt County, though no flood control projects have been proposed. (Smith - North Carolina)
W76-08378

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, PACHECO CREEK, SAN BENITO COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for San Benito County, July, 1973. 18 p, 10 fig, 13 plates, 6 tab.

Descriptors: *Floods, *Flood profiles, *Flood stages, *Flood plains, Flooding, *Flood forecasting, Flood flow, Historic floods, Flood frequency, Peak discharge, Flow duration, Flow characteristics, Flood damage, Rivers, Warning systems, *California, Lake beds, Debris.
Identifiers: San Benito County(Calif), San Felipe Lake(Calif), Pacheco Creek(Calif), Tesquisquita Slough(Calif), Santa Ana Creek(Calif), Arroyo de las Viboras(Calif), Dunneville(Calif), Pajoro River(Calif), Standard Project Flood, Intermediate Regional Flood, Santa Clara County(Calif).

Waters from Pacheco Creek (reach length 37 miles), Tesquisquita Slough, Santa Ana Creek, and Arroyo de las Viboras, flow into San Felipe Lake draining 284 sq mi of San Benito and Santa Clara Counties. The slope of Pacheco Creek is 80 ft/mi above the stream gage near Dunneville and 10 ft/mi below the gage. Development in the flood plain, a very flat ancient lake bed, is agricultural with scattered farm buildings and residences. Levees constructed by local interests protect some portions of the study area but there are no regulatory measures specifically to reduce flood damage. Flooding occurs from heavy rainfall between November and May. Nineteen damaging floods have occurred in the last 125 years with the worst one in December, 1955, having a peak discharge of 12,600 cubic feet per second. Two hundred and fifty persons were evacuated. Anticipated rise of Pacheco Creek near Dunneville would be 14 ft/for an Intermediate Regional Flood (IRF), 17 ft for a Standard Project Flood (SPF). An IRF would have peak discharge of 23,000 cfs, channel velocities of 7-8 ft/sec in the upper study reaches, 5-6 ft/sec in the lower reaches with overbank velocities of 1-3 ft/sec in San Felipe Lake area. The SPF would have a peak discharge of 29,000 cfs with slightly higher flow velocities. (Henley - North Carolina)
W76-08379

FLOOD PLAIN INFORMATION: SAN ANTONIO CREEK AND TRIBUTARIES, VICINITY OF OJAI, VENTURA COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
Prepared for the County of Ventura, June 1973. 34 p, 25 fig, 28 plates, 7 tab.

Descriptors: *Floods, Flooding, *Flood profiles, *Deposition(Sediments), *Flood plains, Floodwater, Regional flood, Flood forecasting, Historic floods, Flood data, Flood frequency, Peak discharge, Flood peak, Erosion, Obstructions to flow, Non-structural alternatives, Land use, Control structures, Dikes, Channel improvement, *California.
Identifiers: San Antonio Creek(CA), Thacher Creek(CA), Reeves Creek(CA), Ojai(CA), *Ventura River(CA), Intermediate Regional Flood, Standard Project Flood.

Most of the lands along the channels are agricultural, primarily orchards and ranches, though there are many houses, utilities, roads and bridges in the flood plains. Pressure for urban expansion is continuing. The drainage basin, covering 51.2 square miles, has both mountains and flatlands, chiefly alluvial cones. Streams include San Antonio Creek flowing into the Ventura River and Thacher Creek with its tributary Reeves Creek. Storms generally occur from November to April, and streamflow is very seasonal because of the lack of snowpack. One streamgage has been in place since 1927. The highest peak flow, 16,200 cubic feet per second, was recorded in 1969. This resulted in $400,000 damages to property owned by the City of Ojai. In an Intermediate Regional Flood a peak discharge of 19,900 cfs with water velocities of 8 to 11 ft/sec in the channel and 4 to 6 ft/sec in the overbank are predicted. The flood would rise 3.5 feet in 1.4 hours and flood stage would last 2.5 hours. In a Standard Project Flood a peak discharge of 26,500 cfs and water velocities of 9 to 13 ft/sec in the channel and 4 to 7 ft/sec in the overbank are anticipated. The height of rise of 4.0 feet would occur in 1.7 hours and the flood stage would last 3 hours. The 8 bridges across the San Antonio River and Thacher Creek would be obstructive to both major floods. Flood control measures include a debris basin constructed to protect the City of Ojai from debris-laden flows, some channel improvement and private dikes, as well as land use ordinances and subdivision ordinances adopted by the County of Ventura which generally require protection from the 50 year flood. (Smith - North Carolina)
W76-08380

FLOOD PLAIN INFORMATION: PURGATOIRE RIVER AND TRIBUTARIES, VICINITY OF TRINIDAD, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
Prepared for the City of Trinidad, Colorado, April 1974. 57 p, 15 fig, 45 plates, 6 tab.

Descriptors: *Floods, *Flood plains, *Flood profiles, *Flood stages, Runoff, Storms, Historic floods, Flood data, Flood frequency, Peak discharge, Flow characteristics, Flow duration, Channels, Flood damage, Flood protection, Dams, Control structures, *Colorado.
Identifiers: *Purgatoire River(Co), *Trinidad(Co), *Las Animas County(Co), Starkville(Co), Raton Creek(Co), Colorado Canyon(Co), Moores Canyon(Co), Prospect Canyon(Co), Pinon Canyon(Co), Portland Avenue Canyon(Co), Hospital Canyon(Co), Carbon Arroyo(Co), Fishers Peak Arroyo(Co), Powell Arroyo(Co), Intermediate Regional Flooding, Standard Project Flood.

Flood hazards are discussed for 7.6 miles of the Purgatoire River extending downstream from the Trinidad Dam, along 4.4 miles of Raton Creek's lower channel through Starkville and along a cumulative total of 9.8 miles of smaller tributaries including Colorado, Moores, Prospect, Pinon, Portland Avenue and Hospital Canyons, and Carbon, Fishers Peak and Powell Arroyos. These streams drain an area of 98 sq mi below Trinidad Dam and have an average slope of 29 ft/mi. The flood plains contain commercial, industrial, utility, highway, and railroad uses. Continued area growth is expected to result in further development of the flood plains. Obstructions to flood flows include

bridges, vegetation, landfills, private levees, and a closed conduit of Fishers Peak Arroyo as it flows through Trinidad's business district. Flood control attempts include channel straightening, concrete retaining walls, bank protection, and the Trinidad Lake project, located 4 mi southwest of Trinidad which regulates flood discharges up to and including those of the Standard Project Flood. Flooding can occur from April through August as the result of frontal storms and thunderstorms. The most damaging historic flood occurred in May 1955 and did $4 million damage in Trinidad and Starkville. Peak discharge on the Purgatoire was 28,000 cubic ft/sec. The Intermediate Regional Flood and the SPF would have peak discharges of 24,500 and 55,100 cfs respectively. The IRF would rise at a maximum rate of 6.5 ft/hour and remain at peak stage for 2 hours. Channel velocities would average 10 ft/sec; overbank flows would average 1.0 ft/sec. Flood heights could reach a maximum of 5.8 and 13 ft above bank in IRF and SPF respectively. (Henley-N. Carolina)
W76-08381

SNOW-REGULATING ROLE OF THE FOREST BELTS IN THE STEPPES OF THE KRASNOYARSK KRAI, (IN RUSSIAN),
For primary bibliographic entry see Field 2C.
W76-08383

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND TRIBUTARIES, GREAT BEND, KANSAS, TO JOHN MARTIN DAM, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
Jun 1974. 30 p, 3 fig, 24 plates, 4 tab.

Descriptors: *Floods, *Floodway, Flooding, Runoff, *River flow, *Zoning, Building codes, *Reservoir, Development policies, *Non-structural alternatives, Levees, Diversion structures, Channel improvement, Flood proofing, Flood insurance, *Kansas, *Colorado.
Identifiers: *Arkansas River, John Martin Dam(CO), Great Bend(KS), Dodge City(KS), Fort Dodge-Wilroads Gardens(KS), Larned(KS), Garden City(KS), Standard Project Flood, Intermediate Regional Flood, Great Bend Local Protection Project.

'Costly floods may be expected to recur in the Arkansas River subbasin between John Martin Dam and Great Bend, Kansas, regardless of existing and authorized flood control projects. Most losses involve flooded agricultural land in the valley, but properties along tributaries and low-lying urban areas also suffer. Flood damages are caused when the runoff from steep tributary streams converges into the broad valleys with flatter slopes and lower energy gradients. These low velocity flood flows not only increase the duration of flooding, but permit sediment and debris to be deposited on the valley's most productive lands. ' The Kansas and Colorado area is dry with considerable water infiltration. It is not unusual that downstream will have much less flow than upstream where flooding has occurred. Eight major floods have occurred since 1900. Floods are caused by rainstorms. Existing flood damage prevention measures include reservoirs, including John Martin Dam and Reservoir, diversion structures, channel and floodway improvements and levees. Designated floodways, zoning ordinances, subdivision regulations and building codes are described as elements of flood plain management designed to reduce flood damage. At Garden City, Kansas, peak discharge for the Standard Project Flood and Intermediate Regional Flood are 114,000 and 53,000 cubic feet per second respectively. (Gentry-North Carolina)
W76-08388

FLOOD PLAIN INFORMATION: SALINE RIVER AND TRIBUTARIES, BENTON, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
Prepared for the City of Benton, October, 1971. 33 p, 17 fig, 15 plates, 8 tab.

Descriptors: *Floods, Flooding, *Flood forecasting, *Flood profiles, *Flood data, *Flood plains, *Arkansas, Flood flow, Streamflow forecasting, Maximum probable flood, Rainfall, Peak discharge, Flood damage.
Identifiers: *Saline River(Ark), Willow Depot Creek(Ark), Benton(Ark), Standard Project Flood, Intermediate Regional Flood, Williams Creek(Ark).

The Saline River Basin comprises 3270 square miles; the drainage area consists of 590 sq mi in the mountain section, 2550 sq mi in the hill section, and 130 sq mi in the flood plain. At Benton, a manufacturing center with a growing population, the drainage basin is about 5 mi long and covers 9 sq mi. As the city expands housing and industrial developments are being built in greater flood-risk areas. The main flood season is winter and spring, though floods have occurred at other times. The greatest flood, in 1927, reached a gage height of 34.0 ft, as measured from a high water mark. The 1969 flood, the largest recorded by streamflow gages, reached a height of 31.0 feet. Flood damages were estimated at $150,000 and included destruction of bridges, loss of livestock and damage to residences. An Intermediate Regional Flood (IRF) would reach a gage height of about 34.1 ft, similar to the 1927 flood, from rainfall amounting to 9.0 inches in 24 hours and 10.7 inches in 48 hours. Water velocities from 11 to 16.5 ft/sec in the channel and 2.5 to 4 ft/sec in the overbank area are predicted. A Standard Project Flood (SPF) would reach a height of 41.1 ft, occurring after rainfall of 8.8 inches in 6 hours, 11.2 inches in 12 hours, 13.8 inches in 24 hours, for a total of 17.4 inches in 96 hours. Water velocities from 12.5 to 21.5 ft/sec in the channel and from 3 to 5 ft/sec in the overbank area are anticipated. Most bridges, with the exception of Interstate 30 Bridge, would be obstructive to the IRF and even more obstructive to the SPF. The feasibility of a dam on the Saline River above Benton is being studied, but no flood prevention measures are now in effect. (Smith - North Carolina)
W76-08389

FLOOD PLAIN INFORMATION: COLORADO RIVER AND RIFLE, GOVERNMENT, HUBBARD GULCH CREEKS, RIFLE, COLORADO.
Army Engineer District, Sacramento, Calif.
Prepared for the City of Rifle, April 1973. 34 p, 12 fig, 16 plates, 7 tab.

Descriptors: Floods, *Flood plains, *Flood data, *Flood profiles, Flood flow, Runoff, Cloudbursts, Snowmelt, Flood plain insurance, Reservoirs, Diversion structure, Peak discharge, Flow duration, Flow characteristics, *Colorado, *Colorado River.
Identifiers: Rifle Creek(Co), Government Creek(Co), Hubbard Gulch Creek(Co), Rifle(Co), Garfield County(Co), Intermediate Regional Flood, Standard Project Flood.

The study area comprises the flood plains along a 3.9 mile reach of the Colorado River (total drainage area 6,930 square miles), the lower 2.8 miles of Rifle Creek (drainage area 201 sq. mi), the lower .6 mile of Government Creek (drainage area 43 sq. mi.), and the lower .8 mile of Hubbard Gulch Creek (drainage area 8 sq. mi.) in the corporate limits of Rifle. Because Rifle is a local center for retail trade, transportation and recovery and processing of mineral resources, continued development is expected with pressure for expansion on the flood plains which are already extensively developed. Damaging floods occur every six years. Major flooding along the Colorado River, usually the result of late spring snowmelt, is characterized by moderate peaks, long duration of flows, and marked diurnal fluctuations Flood damage is chiefly to agricultural development caused by streambank erosion and deposition of silt. Flooding on the creeks normally results from summer cloudbursts runoff and is characterized by high peak flows, short duration, and small volumes. Vegetation, 5 bridges, 2 culverts and Pioneer Ditch diversion structure where silt accumulation has contributed to overbank flooding during high flows obstruct flood flows. The Intermediate Regional Flood and the Standard Project Flood on the Colorado River would have peak discharges of 45,000 and 56,000 cubic feet per second respectively. IRF and SPF peak discharges on Rifle Creek would be 5,700 and 13,000 cfs, respectively. Channel and overbank velocities for these streams are in the range of 8.9 feet per second and 2-4 ft/sec respectively. (Henley - North Carolina)
W76-08390

APPLICATION OF THE NATIONAL WEATHER SERVICE FLASH-FLOOD PROGRAM IN THE WESTERN REGION,
National Weather Service Salt Lake City, Utah. Western Region.
G. Williams.
NOAA TM NWS WR-103, 20 p, 2 fig, 4 tab, 29 ref. January 1976.

Descriptors: *Floods, *Flash floods, *Flood forecasting, Flood data, Warning systems, Flood control, Flood protection, Weather, Weather forecasting, Precipitation(Atmospheric), Networks.
Identifiers: *Flash-flood watches, *Flash-flood warnings, Flood alarms, Flash-flood alarm systems, Rain gage network.

The National Weather Service uses four methods to communicate warning information regarding potential flash floods to the general public. These are flash-flood watches and warnings, a flash-flood alarm system, self-help procedures, and informational materials, each described, along with advantages and some disadvantages. A combination of at least two may be desirable. A technique utilizing an intensity rain gage network would fill a large void left by present methods. Often in the western U.S. soil moisture condition of a basin preceding the rainfall which causes a damaging flash flood is not a dominant factor in affecting amount of runoff. Since very short-term rainfall is the controlling factor in many, if not most flash floods, the traditional flash-flood guidance based on three-hour rainfall which is calculated from antecedent moisture conditions and rainfall duration is not always applicable. A guidance factor related to individual basin characteristics and potential rainfall rates would be more appropriate. (NOAA)
W76-08415

PRESENT AND FUTURE MULTIPLE USE DEMANDS ON THE PINYON-JUNIPER TYPE,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary.
The Pinyon-Juniper Ecosystem: A Symposium. May 1975. Utah State University, Utah Agric. Exp. Stn, Logan. p 19-26 5 fig, 27 ref.

Descriptors: Pinyon pine trees, *Demand, Natural resources, *Forest management, Land use, Land management, Juniper trees, Multiple purpose.
Identifiers: *Pinyon-juniper type, *Multiple use demands.

A discussion is presented of the relative and absolute importance of various uses and demands on pinyon-juniper woodlands, in light of future management requirements. Although various people feel that the pinyon-juniper woodland should be managed to give highest priority to some specific use, such as livestock, wildlife, or wood products, future management should result in a shifting mosaic of activities with each site managed over time for that needed product, product mix, or sequence of uses for which it is best adapted. Whatever the products produced,

the pinyon-juniper lands must be carefully managed; we will need to use our resources ever more efficiently. (Forest Service)
W76-08430

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y.
For primary bibliographic entry see Field 7C.
W76-08507

CHANNEL FLOW OVER PERMEABLE BEDS OF GRADED SPHERES,
Humphreys (Howard) and Sons, Reading (England).
For primary bibliographic entry see Field 8B.
W76-08511

EFFECTS OF HYDROLOGIC REGIME ON MAGNITUDE AND FREQUENCY OF DOMINANT DISCHARGE,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-08514

THE GROUNDWATER OUTCROP-EROSION MODEL; EVOLUTION OF THE STREAM NETWORK IN THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Instituut voor Aardwetenschappen.
For primary bibliographic entry see Field 2A.
W76-08515

SOME THEORETICAL CONSIDERATIONS IN RESERVOIR DESIGN,
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 8B.
W76-08518

A RECONSIDERATION OF THE FIERING TWO-STATION MODEL,
Birmingham Univ. (England). Dept. of Mathematical Statistics.
A. J. Lawrence.
Journal of Hydrology, Vol. 29, No. 1/2, p 77-85, March 1976. 1 ref.

Descriptors: *Model studies, *Synthetic hydrology, *Mathematical studies, Synthesis, Multiple purpose, Correlation analysis, Non-uniform flow.
Identifiers: *Fiering two-station model, *Synthetic flows, Satellite station, Cross-correlation, Skewness, Autoregressive equation.

The Fiering model for the simultaneous generation of synthetic flows at a key station and one satellite station was reconsidered. After pointing out some inadequacies in Fiering's analysis, the model was reformulated. It was then shown how its parameters could be chosen so as to preserve the historical monthly means and variances at each station, and also the first-serial correlation at each station and the simultaneous cross-correlation. The complete correlation structure of the model was obtained. It was further shown how to preserve the historical skewness coefficients of each flow. Finally, a possible extension involving two satellite stations was riefly mentioned. (Roberts-ISWS)
W76-08519

ENVIRONMENTAL MONITORING FROM SPACECRAFT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W76-08532

INVESTIGATION OF ROADWAY DRAINAGE AS RELATED TO THE PERFORMANCE OF FLEXIBLE PAVEMENTS,
South Carolina Univ., Columbia, Coll. of Engineering.
For primary bibliographic entry see Field 8B.
W76-08534

ANALYSIS OF ERTS-1 IMAGERY OF WYOMING AND ITS APPLICATION TO EVALUATION OF WYOMING'S NATURAL RESOURCES,
Wyoming Univ., Laramie. Dept. of Geology.
R. S. Houston, R. W. Marrs, and L. E. Borgman.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-26468, $9.75 in paper copy, $2.25 in microfiche. Final Report, January 1975. 290 p, 13 fig, 1 tab, 127 ref, 25 append. NASA NAS5-21799

Descriptors: *Remote sensing, *Geology, *Vegetation, *Land use, *Wyoming, Satellites(Artificial), Aerial photography, Maps, *Natural resources, Mountains, Agriculture, Soils, Ecology, Forests, Hydrology, Geothermal studies, Snow cover, Snowmelt, Analytical techniques, Computer programs.
Identifiers: *ERTS.

The data provided by the Earth Resources Technology Satellite is unquestionably an important new tool for earth resource applications. Successful applications demonstrated by investigators include: (1) general geologic mapping, (2) structural and tectonic studies, (3) landforms and surface processes, (4) mineral exploration, (5) landuse inventories, (6) hydrologic studies, (7) investigations in agriculture and forestry, and (8) environmental quality and ecology. The chief advantages of the ERTS-1 data for geologic studies are the synoptic view, spectral information, and seasonal coverage. The spectral data and the repetitive aspect are even more important for land use and vegetation studies. The main limitations of the ERTS data are low resolution and lack of stereoscopic coverage. Computer techniques were not used successfully as a means of automated mapping or interpretation, but can provide a very powerful tool to assist the interpreter in some applications. (Sims-ISWS)
W76-08535

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT, AND DEVELOPMENT OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, Md.
For primary bibliographic entry see Field 6B.
W76-08536

THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
S. Cooper, P. Bock, J. Horowitz, and D. Foran.
Available from the National Technical Information Service, Springfield, Va. 22161, as N75 24059, $5.50 in paper copy, $2.25 in microfiche. Final Report, March 1975. 105 p, 26 fig, 5 tab, 7 ref. NASA S-70256-AG.

Descriptors: *Remote sensing, *Reservoir operation, *Water resources, *Water quality, Satellites(Artificial), Instrumentation, Snow cover, Snowmelt, Turbidity, Sedimentation, Floods, Watershed management, Data collections, Data processing, Reservoirs, Dams, Lakes.
Identifiers: *ERTS.

The New England Division, Corps of Engineers (NED) participated in the ERTS-1 experiment to assess the possible future usefulness of satellites such as ERTS in the operation of its water resources systems used to control floods. Based on two years' experience with a 26-station network in New England, NED has found real time data collection by orbiting satellite relay to be both reliable and feasible. Orbiting satellite systems can be designed that are more flexible, easily maintained and less expensive than conventional ground-based means. In the assessment of ERTS imagery, it was found that better spatial resolution and/or additional spectral bands would be required to satisfy NED'S needs, in most cases. Also, the mass of data presented in an image is too unwieldy for timely analysis by photointerpretive techniques. A man-computer interactive system, using Cathode Ray Tube display could solve the latter problem. Real time imagery acquisition on an every day or every other day basis would be essential in a fully operational environment. (Sims - ISWS)
W76-08537

UTILIZATION OF ERTS-1 DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
C. W. Welby, J. O. Lammi, and R. J. Carson, III.
Available from the National Technical Information Service, Springfield, Va. 22161, as N75 20796, $6.75 in paper copy, $2.25 in microfiche. Final Report, October 1, 1974. 154 p, 18 fig, 2 tab, 7 ref. NASA NAS5-21732.

Descriptors: *Remote sensing, *Geology, *Forestry, *Water resources, *North Carolina, Satellites(Artificial), Mapping, Geologic mapping, Land use, Evaluation, Forest management, Water management(Applied), Data processing, Analytical techniques, Rivers, Estuaries, Coasts, Water quality.
Identifiers: *ERTS.

ERTS-1 imagery has been evaluated for use in resource planning and management in North Carolina, and found to be useful for general reconnaissance purposes in forestry, geology, and water resources work. It has also been used for studying largescale transient phenomena such as river plumes and movement of sediment in the sounds. ERTS-1 imagery has been an aid to geologic and land-use mapping. Stereoscopes, projectors of various kinds and microscopes have proved useful instruments for the kinds of data acquisition needed by resource planners and managers. (Sims - (ISWS)
W76-08538

DRAIN ENVELOPE RESPONSE TO FIELD TREATMENTS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. S. Willardson, S. Davis, D. Mulder, and J. R. Spencer.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 1, p 134-136, January-February 1975. 6 fig, 2 ref.

Descriptors: *Drains, *Drainage, *Drainage engineering, *Drainage systems, Hydraulic conductivity.
Identifiers: *Drain envelopes.

One of the principal reasons for installing a drain envelope is to decrease hydraulic resistance in the vicinity of the drain openings. This experiment has shown that contamination of the envelope material with fine particles, whether naturally occurring or added during installation, causes the hydraulic conductivity of a drain envelope to decrease drastically. Furthermore, conditions are created which may result in a discharge rate decreasing with time. A drain with a clean, well-graded envelope will accept water without a water table build-up over the drain. A water table above a drain indicated a back pressure in the drain or a high hydraulic resistance in the envelope. In the experiment, the latter was the reason for poor drain envelope performance but both conditions should be avoided. The results of the experiment

have led to the following conclusions: (a) As little as 5 percent of field soil in the envelope material seriously reduces drain envelope performance, (b) flooding trenches for consolidation of backfill material does not significantly affect drain envelope performance, and (c) high-pressure jet cleaning of drains improves hydraulic performance of drain envelopes. (Skogerboe-Colorado State)
W76-08548

PLANNING IRRIGATION AND DRAINAGE SYSTEMS USING RETENTION AND EXTRACTION LIMITS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 3F.
W76-08553

INTERSTATION CORRELATION OF PEAK-FLOW ESTIMATES,
Geological Survey, Reston, Va.
C. H. Hardison.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 221-222, March-April 1976. 1 fig, 2 ref.

Descriptors: *Peak discharge, *Estimating equations, *Streamflow forecasting, *Gaging stations, *Correlation analysis, Methodology, Statistical methods.

Equations are given for using the correlation coefficient between annual peaks at a pair of stream gaging stations to estimate the interstation correlation coefficient of estimated T-year peaks, computed standard deviations, and computed skew coefficients at the same pair of stations. The equations are based on statistics computed from samples of annual peaks simulated from normal distributions with built-in interstation correlation. The interstation correlation of 50-year peaks was found to be about equal to the square of the interstation correlation coefficient of the annual peaks. (Woodard-USGS)
W76-08555

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 2: NORTHERN GREAT BASIN AND CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-08556

GEOLOGY AND WATER RESOURCES OF MARSHALL COUNTY, SOUTH DAKOTA--PART 1: GEOLOGY AND WATER RESOURCES,
Geological Survey, Huron, S. Dak.
N. C. Koch.
South Dakota Geological Survey University of South Dakota, Vermillion, Bulletin 23, 1975. 76 p, 38 fig, 2 plates, 12 tab, 21 ref, append.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Water quality, *South Dakota, Hydrologic data, Hydrogeology, Aquifer characteristics, Water yield, Water utilization, Water analysis, Chemical analysis.
Identifiers: *Marshall County(S Dak).

Marshall County, a recreational and agricultural County in northeastern South Dakota, has an area of 888 sq mi. Pleistocene glacial and lacustrine deposits of late Wisconsin age and Holocene (Recent) sediments make up most of the surficial deposits. Glacial deposits as much as 805 feet thick overlie sedimentary rocks of Cretaceous age. The surface water supply includes several small intermittent streams and numerous marshes, ponds, and lakes. Most field analyses of water samples from 37 lakes and ponds showed a specific conductance of less than 1,000. Glacial deposits of sand and gravel are the important water-bearing units in Marshall County. Of the six aquifers in drift that are described, the James, Veblen, and Coteau-lakes aquifers can provide yields of 500 gpm or more to properly constructed wells. The major constituents of these aquifers are calcium, sodium, bicarbonate, and sulfate. The Dakota aquifer, consisting of sandstone of Cretaceous age, underlies all of Marshall County at depths of from 900 to 1,500 ft. Water in the aquifer is under artesian pressure and in low-lying areas many wells flow. Water from the Dakota aquifer is not suitable for irrigation because of its poor quality. (Woodard-USGS)
W76-08558

WATER QUALITY IN THE MAD RIVER BASIN, HUMBOLDT AND TRINITY COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-08562

HYDROLOGY OF THE THREE SINKHOLE BASINS IN SOUTHWESTERN SEMINOLE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
W. Anderson, and G. H. Hughes.
Florida Bureau of Geology, Tallahassee, Report of Investigations No 81, 1975. 35 p, 15 fig, 8 ref.

Descriptors: *Lake stages, *Sinks, *Karst hydrology, *Urbanization, *Flood protection, *Florida, Environmental effects, Lakes, Water levels, Flood plains, Hydrologic data, Topography, Geology, Groundwater movement, Surface waters, Streamflow, Aquifers.
Identifiers: Seminole County(Fla), *Sinkhole basins.

The southwestern part of Seminole County in east-central Florida is characterized by sinkholes formed by the subsidence of surficial deposits into solution cavities in the underlying limestone deposits. The area includes three sinkhole basins: Cranes Roost, Palm Springs, and Grace Lake. Cranes Roost basin (drainage area, 5.02 sq mi) contains a closed drainage system of lakes and swamps, including Lakes Adelaide, Florida, and Mobile, that terminates at Cranes Roost sink. It also contains Lake Orienta and two unnamed sinks which do not overflow into Cranes Roost sink. Palm Springs basin (drainage area, 1.77 sq mi) includes Lake Marion, Eleventh Hole Pond, and several small unconnected sinks. Grace Lake basin (drainage area, 1.64 sq mi) includes Island Lake which overflows into Grace Lake. The recent spread of urban development has tended to encroach on the flood plains of lakes in these sinkhole basins and cause concern over flood hazards. An investigation was made to document the highest known lake levels, to examine possible effects of urbanization, and to appraise the possibilities of controlling lake levels to reduce or limit the flood hazard. The highest lake stages of record in the three sinkhole basins occurred in September 1960. Analyses of the hydrologic relations between lake stages, groundwater levels, stream discharges, and rainfall in the area indicated that the lake stages of September 1960 probably were the highest attained since at least 1895. (Woodard-USGS)
W76-08572

OUTFLOW FROM VARIOUS SUBSURFACE DRAINAGE MATERIALS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
T. G. Sommerfeldt.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 1, p 85-88, 94, January-February 1975. 8 fig, 2 tab, 16 ref.

Descriptors: *Drainage, Drainage engineering, *Drainage systems, *Drains, Lysimeters, *Subsurface drainage.

In lysimeters, the discharge from 55-, 65-, and 105-mm-ID perforated plastic drains and 105-mm-ID clay tile drains, with and without gravel or fiberglass envelopes, was determined in clay loam and fire sandy loam soil. In the field, the rate and volume of discharge from 65-mm flexible plastic and 105-mm clay tile drains, installed with fiberglass envelopes in 1968, were determined between 1969 and 1971. The soil, which was coarse textured, was flooded five times in 1969, six times in 1970, and twice in 1971. Generally, no one drain produced greater discharge than another. (Skogerboe-Colorado State)
W76-08669

PRELIMINARY HYDROLOGIC DESIGN OF SMALL FLOOD DETENTION RESERVOIRS,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 8B.
W76-08731

EXTREME RAINFALL STUDIES OF THE BRAHMANI, THE BURHABALANG, THE RUSHIKULYA AND THE SUBARNAREKHA RIVER CATCHMENTS,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2B.
W76-08733

COMPLEX WIDTH-DISCHARGE RELATIONS IN NATURAL RIVER SECTIONS,
Lanchester Polytechnic, Coventry (England).
For primary bibliographic entry see Field 2E.
W76-08735

DISTRIBUTIONS OF BOD AND DO IN RIVERS AND LAKES,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
For primary bibliographic entry see Field 5B.
W76-08743

4B. Groundwater Management

GROUND WATER FLOW NO LONGER A MYSTERY,
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 2F.
W76-08114

DETERMINING AQUIFER TRANSMISSIVITY BY MEANS OF WELL RESPONSE TESTS: THE UNDERDAMPED CASE,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 2F.
W76-08124

ESTIMATION BY DIGITAL COMPUTER OF THE DRAWDOWN CAUSED BY GROUNDWATER WITHDRAWAL,
Research Inst. for Water Resources Development, Budapest (Hungary).
F. Szekely.
Hydrological Sciences Bulletin, Vol. 20, No. 3, p 341-351, September 1975. 3 fig, 1 tab, 8 ref.

Descriptors: *Drawdown, *Pumping, *Computer programs, Digital computers, Regional analysis, Evaporation, Seepage, Equations, Water wells, Water table, Water table aquifers, Numerical analysis, Approximation method, Transmissivity, Groundwater, *Withdrawal.
Identifiers: Regional drawdown, Local drawdown, Boussinesq equation.

The method described has been developed for estimating the two-dimensional, unsteady drawdown space created by groundwater withdrawal. In the analysis of regional drawdown, discrete wells are replaced by two-dimensional withdrawal distributed uniformly over the well field. Withdrawal of this kind can be approximated by the phenomenon of evaporation, and allowed for directly in the differential equation of two-dimensional, unsteady seepage by introducing an additional function. (Visocky-ISWS)
W76-08140

WATER SUPPLY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 4A.
W76-08153

METHOD FOR LOCATING AND EVALUATING GEOTHERMAL SOURCES OF ENERGY BY SENSING ELECTROSTATIC VOLTAGE GRADIENTS,
W. L. Sayer, and P. Wright.
U.S. Patent No. 3,942,101, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 461, March 2, 1976.

Descriptors: *Patents, *Geothermal studies, *Thermal properties, Thermal conductivity, Geophysics, Electrical equipment.
Identifiers: 'Nernst Effect', Voltage gradient.

A method and apparatus for locating and evaluating geothermal sources of energy are described. Rather than drilling many trial boreholes and recording subsurface temperatures, the invention makes use of a natural phenomenon known as Nernst Effect. It is believed that a given geothermal heat flux eminating vertically through the earth to the surface subjected to the earth's natural magnetic field produces a voltage gradient of a given magnitude in the earth and that this gradient is reflected in an electrostatic voltage gradient of equal magnitude above the earth's surface. The method of the invention calls for the sensing or detecting of such electrostatic voltage gradients by a probe mounted on a suitable vehicle, the recording of the voltage gradients noting the relative location on the earth's surface in the test area of such detection, and the subsequent evaluating of the recorded gradients preferably by geographically plotting the readings on a map at the points recorded to locate the geothermal source of the greatest commercial potential. (Sinha - OEIS)
W76-08204

UNDERGROUND DETENTION FOR STORM OVERFLOWS.
For primary bibliographic entry see Field 8G.
W76-08234

ABOUT THE PROBLEM OF DIRECT RUNOFF DETERMINATION BY SEPARATION OF THE HYDROGRAPH COMPONENTS (K OTAZKE URCENIA PRIMAEHO ODTOKU SEPARACIOU PRIETOKOVYCH VLN),
For primary bibliographic entry see Field 2A.
W76-08238

DRAINAGE RUNOFF OF THE GROUNDWATER UNSTEADY FLOW TO THE DRAINS (DRENAZNY ODTOK PRI NEUSTALENOM PRUDENI PODZEMNEJ VODY K DRENOM),
I. Radcenko.
Vodohospodarsky Casopis, Vol. 21, No. 3-4, p 410-436, 1973. 14 fig, 5 tab, 6 ref.

Descriptors: *Hydrologic aspects, *Groundwater movement, Drains, Drainage, Runoff, Porous media, Filtration, Hydraulics.

The groundwater drainage flow to a system of horizontal parallel drains bedded in a homogeneous and isotropic porous media was studied experimentally. The problem of two-dimensional filtration flow in a vertical plane investigated by the viscous analogue is based on previous work in which the decreasing speed of the depression level vertex point in the midpoint of parallel drain spacing was studied. The relationship between the momentaneous relative height of this vertex point and the total relative groundwater volume runoff with a decreasing depression level is detailed. It is shown that the vertex point drop speed and momentaneous and maximum measuring drainage runoff do not depend on the geometrical shape of the drain but on its filtration active perimeter. The distance of the impermeable layer surface significantly affects the drop speed of the depression level between the drains; and, the closer the drains are bedded to the surface of the impermeable surface the greater the retarding effect of the impermeable layer surface which then cannot be considered as negligible. (Sandoski-FIRL)
W76-08239

TOWN HALTS INFILTRATION.
For primary bibliographic entry see Field 5D.
W76-08257

TRANSIENT FREE SURFACE FLOW TO A WELL: AN ANALYSIS OF THEORETICAL SOLUTIONS,
Centro di Ricerca IBM di Venezia (Italy).
For primary bibliographic entry see Field 2F.
W76-08333

HYDROGEOLOGY OF THE SOUTH FORK OF LONG ISLAND, NEW YORK,
Wisconsin Univ. Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W76-08347

ATTITUDES AND PUBLIC PARTICIPATION ON THE HIGH PLAINS TOWARD GROUNDWATER PLANNING AND MANAGEMENT INSTITUTIONS,
Texas Tech Univ., Lubbock. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W76-08375

STAFFLINERS PREVENT CONTAMINANTS FROM POLLUTING GROUND WATER AT INDUSTRIAL WASTE TREATMENT CENTER.
For primary bibliographic entry see Field 5D.
W76-08466

RADIAL DISPERSION THROUGH ADSORBING POROUS MEDIA,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W76-08512

TRANSIENT AQUIFER FLOWS BY CHARACTERISTICS METHOD,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-08513

IMPROVED IMAGE-WELL TECHNIQUE FOR AQUIFER ANALYSIS,
Birmingham Univ. (England). Dept. of Civil Engineering.
Y. K. Chan.
Journal of Hydrology, Vol. 29, No. 1/2, p 149-164, March 1976. 10 fig, 3 tab, 7 ref, 1 append.

Descriptors: *Aquifers, *Pumping, *Boundaries(Surfaces), *Drawdown, *Methodology, Theis equation, Analytical techniques, Observation wells, Hydraulics.
Identifiers: *Method of images, Leaky aquifer, Well functions.

The conventional image-well method does not yield accurate values of drawdown at large values of elapsed time since the commencement of pumping, when the number of images required becomes too large from the computational point of view. A reduction in error can be achieved by selecting an alternative image pattern; the actual form of the pattern depends on the particular boundary conditions. This improved image-well method involves a rearrangement of the image pattern. It overcomes the inherent uncertainty of the conventional method of images as to whether the number of images used is adequate to include a particular range of time. The improved method was tested at length by considering particular examples for non-leaky and leaky aquifers with fully-penetrating constant-discharge wells. Recommendations were made for a more efficient method of evaluating the integral form of the well functions. (Singh-ISWS)
W76-08517

DYNAMIC RESPONSE OF AQUIFER SYSTEMS TO LOCALIZED RECHARGE,
Chile Univ., Santiago. Centro de Recursos Hidraulicos.
For primary bibliographic entry see Field 2F.
W76-08520

TRANSFER OF BORON AND TRITIATED WATER THROUGH SANDSTONE,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-08547

SELECTED HYDROLOGIC DATA, CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-08557

GEOLOGY AND WATER RESOURCES OF MARSHALL COUNTY, SOUTH DAKOTA--PART 1: GEOLOGY AND WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-08558

DESIGN OF GROUND-WATER LEVEL OBSERVATION NETWORK.
Geological Survey, Reston, Va.
Open-file report 76-165, March 1976. 6 fig, 12 tab, 12 ref, 5 append.

Descriptors: *Groundwater resources, *Project planning, *Foreign projects, *Observation wells, *Analytical techniques, Management, *Water levels, *Network design, Evaluation, Systems analysis, Aquifers.
Identifiers: *Israel, Groundwater levels.

In January 1971, a cooperative study was initiated by the Hydrological Service of Israel and the U. S. Geological Survey to develop concepts and systems analytic techniques for the design of groundwater data collection systems with the objective of providing hydrologic information for planning and managing water resource systems. This report summarizes the results of the study which was completed in January 1972. While some of the results pertain specifically to the data program of the Hydrological Service of Israel, the analytic techniques of design developed are quite general and are not restricted to problems in Israel. (Woodard-USGS)
W76-08563

AMINO ACIDS AND GASES IN SOME SPRINGS AND AN OIL FIELD IN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. B. Rapp.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 227-232, March-April 1976. 1 fig, 2 tab, 10 ref.

Descriptors: *Groundwater movement, *Water analysis, *Amino acids, *Gases, *Oil reservoirs, Oil industry, Organic matter, Movement, Analytical techniques, Oil industry, *California.

Samples of water and gas were collected from six springs and two wells in the Upper Cretaceous Great Valley sequence and Franciscan Formation underlying the Coast Range of northern California and from four oil wells penetrating Tertiary sedimentary rocks in the Kettleman North Dome oil field. Comparison of the dissolved free amino acid compositions of the waters from the two locations show overlapping ranges with many more similarities than differences. The detection of nonprotein amino acids indicates the protein degradation is partly chemical rather than strictly biological. Other low molecular weight degradation products (methane, ethane, nonvolatile organic acids, and other organic chelating agents) were found. This may be one mechanism for the transportation of organic matter from the source rocks to the reservoir rocks of an oil deposit. (Woodard-USGS)
W76-08568

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN BRAZORIA, FORT BEND, AND WALLER COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
W. L. Naftel, K. Vaught, and B. Fleming.
Texas Water Development Board, Austin, Report 201, March 1976. 89 p, 3 fig, 12 tab, 3 ref.

Descriptors: *Hydrologic data, *Groundwater resources, *Water levels, *Chemical analysis, *Drillers logs, Texas, Well data, Aquifer characteristics, Water quality, Water chemistry, Basic data collections.
Identifiers: *Brazoria County(Tex), *Fort Bend County(Tex), *Waller County(Tex).

Reports describing the groundwater resources of Brazoria, Fort Bend, and Waller Counties, Texas, were prepared and published in 1973, 1972, and 1969, respectively. Sandeen and Wesselman (1973), in describing the resources of Brazoria County, tabulated records of wells, drillers' logs, water-level measurements, and chemical analyses gathered during the course of this study. This report presents data (1966-74) collected since the investigation by Sandeen and Wesselman (1973) and updates records tabulated by Wesselman (1972) in Fort Bend County and by Wilson (1969) in Waller County. These records are being collected in cooperation with the Texas Water Development Board to evaluate the groundwater resources of the greater Houston-Galveston region. (Woodard-USGS)
W76-08569

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1970-74,
Geological Survey, Austin, Tex.
W. L. Naftel, K. Vaught, and B. Fleming.
Texas Water Development Board, Austin, Report 203, March 1976. 170 p, 2 fig, 8 tab, 9 ref.

Descriptors: *Hydrologic data, *Groundwater resources, *Water levels, *Chemical analysis, *Drillers logs, Texas, Well data, Aquifer characteristics, Water quality, Basic data collections, Water chemistry.
Identifiers: *Harris County(Tex), *Galveston County(Tex).

The collection of hydrologic data in Harris and Galveston Counties, Texas, was begun by the U. S. Geological Survey in 1929 and 1938, respectively. The current data-collection program is in cooperation with the Texas Water Development Board and the cities of Houston and Galveston. The data-collection program consists of an inventory of new large-capacity and other selected wells, the collection of water samples from wells for chemical analyses, an inventory of groundwater pumpage, water-level measurements in observation wells, pumping tests on large-capacity wells and a compilation of information on land-surface subsidence. Also included are drillers' logs, water-level measurements, and chemical analyses of groundwater collected during the period 1970-74. Additional information on the geology and hydrology of the area may be found in publications listed under 'Selected References.' (Woodard-USGS)
W76-08570

ARTIFICIAL-RECHARGE EXPERIMENTS IN THE ALLUVIAL AQUIFER SOUTH OF FOUNTAIN, EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
O. J. Taylor.
Colorado Water Conservation Board, Denver, Water Resources Circular No 31, 1975. 28 p, 9 fig, 4 plates, 5 tab, 5 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Pit recharge, *Water spreading, *Colorado, Alluvial aquifers, Ponds, Aquifer characteristics, Irrigation, Underground storage, Water wells, Well data, Hydrologic data, Groundwater availability.
Identifiers: El Paso County(Colo), *Groundwater management.

Artificial recharge experiments were conducted in the alluvium along Fountain Creek and south of Fountain, Colo. The saturated thickness of the sand and gravel aquifer ranges from 0 to 34 ft. The transmissivity of the aquifer ranges from 0 to 40,000 sq ft per day. The water table slopes downstream indicating a southerly direction of groundwater movement. Five artificial recharge pits were excavated in the unsaturated zone above the alluvial aquifer. Each pit site was instrumented to measure inflow, stage fluctuations, and water-table fluctuations. The 15 experiments, each of approximately 12-days' duration, indicated that artificial recharge varied with pond stage. The average adjusted artificial recharge rate for the five pits ranged from 0.1 to 4.7 feet per day. The annual amount of recharge from operation of the five pits was estimated as 16,000,000 cu ft. Observed transmission losses in the canal system indicate that the alluvial aquifer is also recharged through the present irrigation practices. Other promising locations for artificial recharge pits are in coarse material in the relatively thick unsaturated zone above the aquifer. Another advantage of artificial recharge in this area is that it would delay the loss of recharged water to underflow or flow from the aquifer to Fountain Creek. Large-capacity wells in this aquifer yield as much as 2.78 cfs and could be used to withdraw the water stored in the alluvial aquifer. (Woodard-USGS)
W76-08571

PLUTONIUM RADIONUCLIDES IN THE GROUNDWATERS AT ENEWETAK ATOLL,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W76-08607

EXIT OF GROUND WATERS ON DRAINAGE BOUNDARIES,
Ebasco Services Inc., New York.
For primary bibliographic entry see Field 2F.
W76-08750

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary, M. B. Baker, Jr., P. F. O'Connell, T. N. Johnsen, Jr., and R. E. Cambell.
Research Paper RM-128, October 1974. 28 p, 12 fig, 9 tab, 78 ref.

Descriptors: Pinyon pine trees, Juniper trees, Watersheds(Basins), *Arizona, *Water yield improvement, *Forest management, Multiple purpose, Natural resources, Land use, *Watershed management, Forest watersheds.
Identifiers: Beaver Creek Project(Ariz), Mogollon Rim(Ariz), *Pinyon juniper type.

Results from six treated and control watersheds, along with other results from southwestern pinyon-uniper watersheds, suggest that: (1) mechanical methods of pinyon-juniper removal are not likely to increase water yield; (2) removal of pinyon-juniper overstory by herbicides can increase water yield; (3) there has been no statistical verification of changes in flood peaks or water quality due to treatment; (4) herbage yields increase after virtually all pinyon-juniper treatments, but potential livestock carrying capacity varies greatly due to differences in plant composition; (5) the response by deer to these treatments is, on the average, neutral; (6) the more successful conversion projects just about break even from a benefit-cost standpoint under 1972 economic conditions. (Forest Service)
W76-08108

MULTIPLE USE EVALUATIONS ON PONDEROSA PINE FOREST LAND,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08109

PINYON-JUNIPER CONTROL--DOES IT PAY,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08110

LAND USE AND WATER QUALITY IN NEW YORK RIVERS,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08133

CHANGE IN YIELD OF WATER FOLLOWING A BUSHFIRE IN A FOREST OF EUCALYPTUS REGNANS,
Melbourne and Metropolitan Board of Works (Australia).
K. J. Langford.
Journal of Hydrology, Vol. 29, No. 1/2, p 87-114, March 1976. 9 fig, 9 tab, 27 ref.

Descriptors: *Forest fires, *Hydrologic aspects, *Forests, *Australia, *Water yield, Streamflow, Canopy, Fog, Statistical methods, Transpiration.
Identifiers: *Bushfire, *Yield changes, *Fogdrip, *Canopy interception, *Eucalyptus regnans, Leaf water potential, Non-parametric statistical methods.

The hydrological changes following regeneration by fire of forests of Eucalyptus regnans were analyzed in detail using non-parametric statistical methods. The streamflow data showed that three

to five years after the fire the flows started declining below the levels prevailing before the fire. The average annual reduction in flow over the 163-sq km study area for a 21-year period was 35,000 MI or 24% of the average streamflow before the fire. Measurements of fogdrip and canopy interception showed that those processes could not be the sole cause of the reduction in flow. A difference in transpiration is the most likely cause. Since E. regnans is one of the world's tallest hardwood species, the height of the mature trees and consequent low leaf water potential could be increasing the stomatal resistance to the diffusion of water vapor; difference in transpiring biomass and energy exchange within the canopy could also cause important differences between the water consumption of mature and regrowth forests. (Roberts - ISWS)
W76-08349

FIRST-YEAR WATER YIELD INCREASE AFTER FOREST CUTTING: AN ALTERNATIVE MODEL,
Forest Service (USDA), Athens, Ga. Forestry Sciences Lab.
J. W. McMinn, and J. D. Hewlett.
Journal of Forestry, Vol. 73, No. 1, p. 654-655, 1975. 4 ref.

Descriptors: *Watersheds(Basins), *Water yield, *Model studies, *Forest management, *Cutting management, Vegetation effects, Evapotranspiration, Forest watersheds, Evaporation.

A simple, linear model using data on differences in slope, aspect, climate, and vegetative conditions is useful within the usual range of heavy stand density reductions, but a non-linear model logically consistent over a range of possible forest-cover removals is derived. Responses of total evapotranspiration rates to forest cover changes indicate that soil evaporation is reduced by even limited cutting. Small reductions in net evapotranspiration increase net water yields. When less than 10% of the stand is removed, increases cannot be detected by hydrological methods, and water yield responses are not linear. The general model should be used cautiously in cases of patch clearcutting, strip cutting, or single tree selection where a substantial basal area is removed, but should be satisfactory where a small percentage of the basal area is removed. The model provides logical predictions over the entire range of the independent variable and is so flexible that other curve forms will only require new estimates of parameters rather than new algebraic forms. A series of curves passing through zero but ranging from 25-100% reduction is basal area should result. (Buchanan-Davidson--Wisconsin)
W76-08362

URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Upper Darby, Pa. Engineering Div.
For primary bibliographic entry see Field 4D.
W76-08509

NONPARAMETRIC STATISTICAL ANALYSIS OF ANNUAL PEAK FLOW DATA FROM A RECENTLY URBANIZED WATERSHED,
Mount Rogers Planning District Commission, Marion, Va.
T. R. Lazaro.
Water Resources Bulletin, Vol. 12, No. 1, p 101-107, February 1976. 4 tab, 6 ref.

Descriptors: *Statistical methods, *Land use, *Peak discharge, *Maryland, River basins, Watersheds(Basins), Analysis, Rainfall intensity, Urban hydrology, *Urbanization.
Identifiers: *Nonparametric statistical analysis, Central tendency, *Maximum annual peak flow series, *Patuxent River basin(Md), Northeast Branch of the Anacostia River(Md), Wilcoxon test, Peak flow data, Rainstorms.

Annual maximum peak flow data for the Northeast Branch Basin, a recently urbanized Washington, D.C., suburban watershed, were analyzed in order to demonstrate the feasibility of a nonparametric statistical application in investigating the hydrologic impact of the rapid land use change accompanying intense urbanization. Annual peak flow data from the Patuxent Basin above Unity, Maryland, a rural watershed in close proximity to the study area, were compared to data from the Northeast Branch for the same period utilizing the Wilcoxon matched-pairs signed-ranks test. A change in central tendency of each series was noted at the 0.01 significance level; however, the change was negative in the rural basin and positive in the urbanized Northeast Branch Basin. This central tendency change was considered indicative of an average decrease in the size of rainstorms producing annual maximum peak discharges. Rainstorm data from the Northeast Branch Basin were divided into two equal periods (before urbanization and after) and the Wilcoxon test was applied. It was found that rainstorms producing maximum annual peak discharges in the urbanized period were indeed smaller than those in the prior period (0.01 level of significance); however, larger annual peaks were produced. It was concluded that nonparametric statistical methods could be used readily with conventional methods to isolate and clearly analyze the various problems in an actual urban hydrologic study. (Roberts-ISWS)
W76-08522

INVESTIGATION OF ROADWAY DRAINAGE AS RELATED TO THE PERFORMANCE OF FLEXIBLE PAVEMENTS,
South Carolina Univ., Columbia, Coll. of Engineering.
For primary bibliographic entry see Field 8B.
W76-08534

HYDROLOGY OF THE THREE SINKHOLE BASINS IN SOUTHWESTERN SEMINOLE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-08572

LAKE ERIE AND ITS BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-08723

4D. Watershed Protection

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-08108

USE AND MISUSE OF THE UNIVERSAL SOIL LOSS EQUATION,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W76-08120

ON-SITE RUNOFF DEPLETION AT THREE IMPOUNDMENTS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 4A.
W76-08122

MEASURING WATERSHED LAND-USE CHANGES WITH AIRPHOTOS,
Clemson Univ., S. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-08229

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 3 - ANALYSIS OF FLOW MODELS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08280

THE RELATIONSHIP BETWEEN WATERSHED USE AND STREAM WATER QUALITY,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins, and D. C. Mahan.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 424, $4.00 in paper copy, $2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, East Lansing, March 1976. 24 p, 1 fig, 9 tab, 17 ref. OWRT A-081-MICH(1). 14-31-0001-5022.

Descriptors: *Watersheds(Basins), *Land use, Aquatic environment, Streams, Runoff, *Michigan, Remote sensing, *Land classification, Watershed management, Aerial photography, *Water quality.
Identifiers: *Augusta Creek(Mich), Trout streams.

Augusta Creek is a small, hardwater, brown trout stream flowing south through parts of Barry and Kalamazoo Counties, Michigan, into the Kalamazoo River. Land use patterns were mainly determined through use of infrared aerial photography. Between 50 and 60% of the land is forested of which two-thirds is deciduous upland forest and one-third forested wetlands. About 30 per cent of the land is used for farming, equally apportioned between pasture and cultivation. The rest of the land (10 to 20%) would be classified as wetlands. The total basal area of trees progressively increased moving back from the stream at both locations. This seems to reflect the fact that along Augusta Creek, and most streams observed locally, the immediate stream-side vegetation is composed mainly of shrubs such as dogwood (Cornus) and willow (Salix) with the larger trees such as Acer and oak (Quercus) usually found some distance back. Though vegetative cover was quite extensive, there was a preponderance of small trees. Preliminary data are presented on particulate organic detritus, weekly temperature records, weekly discharge measurements, and species and number of fish collected. The objective was to characterize the basic land uses within the watershed of a southern Michigan trout stream and to eliminate possible effects of land uses on measured physical and biological stream parameters.
W76-08282

INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4A.
W76-08326

FIRST-YEAR WATER YIELD INCREASE AFTER FOREST CUTTING: AN ALTERNATIVE MODEL,
Forest Service (USDA), Athens, Ga. Forestry Sciences Lab.
For primary bibliographic entry see Field 4C.
W76-08362

THE CHERRY CREEK-CASSELMAN RIVER ENVIRONMENTAL IMPROVEMENT PLAN,
Maryland Dept. of Natural Resources, Annapolis.
For primary bibliographic entry see Field 5G.

W76-08384

PREPARATION OF PLANS AND SPECIFICATIONS FOR POLLUTION ABATEMENT ACTIVITIES IN CHERRY CREEK WATERSHED, MARYLAND.
Skelly and Loy, Harrisburg, Pa.; and Zollman Associates, Inc., Baltimore, Md.
For primary bibliographic entry see Field 5G.
W76-08385

MINE DRAINAGE POLLUTION WATERSHED SURVEY, CHERRY CREEK, CASSELMAN RIVER WATERSHEDS, GARRETT COUNTY, MARYLAND.
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W76-08386

URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Upper Darby, Pa. Engineering Div.
Technical Release No. 55, January 1975. 98 p, 14 fig, 7 tab, 29 ref, 5 append.

Descriptors: *Watershed management, *Urban hydrology, *Urban runoff, *Urban drainage, Hydrology, Hydrologic systems, Rainfall-runoff relationships, Runoff coefficient, Soil types, Land use, Surface runoff, Storage requirements, Storm runoff, Stage-discharge relations, Detention reservoirs, Urbanization, Watersheds(Basins), Discharge(Water), Environmental effects, Storm drains, Peak discharge.
Identifiers: *Soil cover complex, *Runoff curve number, Hydrologic soil group, Gutter flow, Runoff reduction, Peak flow reduction.

A guide was presented for estimating the effects of land use changes and structural measures on hydraulic and hydrologic parameters, runoff volume, and peak rates of discharge. Examples were used to demonstrate the proper use on urbanizing areas of the soil-cover complex and associated runoff curve numbers developed earlier by the Soil Conservation Service for rural areas. Advantages and disadvantages of many methods for reducing runoff and delaying the time of runoff were discussed. Appendixes provided classification of hydrologic soil groups and 24-hour rainfall amounts in the United States for various frequencies. (Terstriep-ISWS)
W76-08509

NONPARAMETRIC STATISTICAL ANALYSIS OF ANNUAL PEAK FLOW DATA FROM A RECENTLY URBANIZED WATERSHED,
Mount Rogers Planning District Commission, Marion, Va.
For primary bibliographic entry see Field 4C.
W76-08522

AN OPTIMIZATION TECHNIQUE ADAPTED TO USDAHL-74 REVISED MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W76-08523

SOIL LOSS FROM ILLINOIS FARMS - ECONOMIC ANALYSIS OF PRODUCTIVITY LOSS AND SEDIMENTATION DAMAGE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
K. Guntermann, M. T. Lee, A. S. Narayanan, and E. R. Swanson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 584, $4.75 in paper copy, $2.25 in microfiche. Illinois Institute for Environmental Quality Document No. 74-62, December 1974. 76 p, 6 tab, append.

Descriptors: *Soil erosion, *Economics, *Farm management, *Illinois, Erosion, Sedimentation, Soils, Erosion control, Erosion rates, Cultivation, Rotations, Crops, Soil stabilization, Economic justification, Net income, Tangible benefits, Agriculture.

The purpose of this project was to estimate the economic costs of erosion and sedimentation. Some studies have estimated the effect of erosion and sedimentation on productivity and net farm income but none has combined these results with the off-site sediment damage costs caused by the erosion after the soil has left the farm site. This project estimated the magnitude of these off-site sediment damage costs and combined them with estimates of the effect of on-site productivity losses on private net income to develop a more comprehensive social measure of the entire problem of erosion and sedimentation. Perhaps the most significant finding to emerge from this research was the very slight effect that erosion had on private net income over a 20-year period and the insignificant effect it had on net land rents beyond 20 years. For 5 of the 6 watersheds studied, the reduction in private net income was generally less than $1 per acre over 20 years except for the use of conventional tillage and up-and-down cultivation, where the reduction occasionally reached $2/acre. For the sixth watershed, where erosion was a severe problem for certain crop management combinations, the reduction in income did reach $10/acre in one case, but was generally small for most other alternatives. This finding has important implications for the treatment of the erosion and sedimentation problem since it means that individual farmer-producers have very little in the way of a private incentive to reduce the erosion problem on their farms. (Sims-ISWS)
W76-08533

WATER YIELD IMPROVEMENT BY VEGETATION MANAGEMENT: FOCUS ON ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W76-08539

WATERSHED SOIL DETACHMENT AND TRANSPORTATION FACTORS,
Agricultural Research Service, Morris, Minn.
For primary bibliographic entry see Field 2J.
W76-08551

WATER QUALITY IN IRRIGATED WATERSHEDS,
California Univ., Riverside. Dept. of Soil Science Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08679

IMPLEMENTATION OF HYDROLOGIC MODELS AT GODDARD SPACE FLIGHT CENTER.
IBM Space Systems Center, Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W76-08745

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ADENOSINE TRIPHOSPHATASE ACTIVITY IN BRAIN, INTESTINAL MUCOSA, KIDNEY, AND LIVER CELLULAR FRACTIONS OF THE RED-EARED TURTLE FOLLOWING IN VITRO TREATMENT WITH DDT, DDD, AND DDE,
Middle Tennessee State Univ., Murfreesboro. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08115

NUTRIENT AND SEDIMENT CHARACTERISTICS OF TILE EFFLUENT IN OHIO,
Ohio State Univ. Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08121

TWO-DIMENSIONAL MATHEMATICAL WATER QUALITY MODEL,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-08135

EVALUATION OF METHODS FOR PRESERVING THE LEVELS OF SOLUBLE INORGANIC PHOSPHORUS AND NITROGEN IN UNFILTERED WATER SAMPLES,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
E. D. Klingaman, and D. W. Nelson.
Journal of Environmental Quality, Vol. 9, No. 1, p 42-46, 1976. 3 tab, 11 ref.

Descriptors: *Analytical techniques, *Preservation, *Phosphorus, *Nitrogen, *Water sampling, Methodology, Filtration, Agricultural runoff, Freezing, Sediments, Ammonia, Nitrates, *Pollutant identification.
Identifiers: Mercuric chloride, Phenylmercuric acetate.

Because little information is available on preservation of water samples from agricultural runoff for inorganic nitrogen and phosphorus analysis, sample preservation techniques applicable to surface runoff, tile drainage water, and streams were developed. Criteria for selection of preservation techniques include the ability to maintain inorganic nitrogen and phosphorus components within 5% of the initial value, minimal hazard to personnel, and compatibility with field sampling procedures and analytical methods. The best overall technique for preserving samples for phosphorus and nitrogen analysis is storage at subzero temperatures. However, frozen storage may result in low recovery of soluble inorganic phosphorus in samples containing sediment. If a decrease occurs due to freezing, a portion of the water may be filtered before freezing, thus permitting accurate estimates of soluble inorganic phosphorus (SIP). SIP was stabilized by addition of mercuric chloride and storage at 4C, but ammonia and nitrates were not preserved for long periods (12 weeks). Soluble inorganic nitrogen was preserved by addition of phenylmercuric acetate and storage at 4C, but SIP concentrations increased in some samples during storage. Storage at 4C or 23C without addition of a chemical preservative caused large changes in the content of SIP and nitrogen. (Buchanan-Davidson--Wisconsin)
W76-08157

NEW METHODS FOR ECOLOGICAL ANALYSIS OF MICROORGANISMS OF EUTROPHIC WATERS, (IN SPANISH),
Institute National de Limnologia, Santo Tome (Argentina).
F. Emiliani.
Microbiol Esp. 25(3);p 175-178, 1972.

Descriptors: *Pollutant identification, *Methodology, Isolation, *Microorganisms, Ecology, Lakes, Eutrophication, Filters, Sampling, Cultures.

A new, simple culture method for isolation and enumeration of indigenous freshwater microorganisms is described. It employs Millipore filters and lake water as a renewable medium. Within a 160 mm Petri dish, a 100 mm Petri dish bottom is placed. Humidity is maintained by water in the

larger bottom. In the smaller bottom a fritted glass disc acts as a support for a Millipore filter disc, through which a measured amount of lake water has been drawn. Filter-sterilized lake water, introduced into the smaller bottom and renewable periodically, serves as a medium for the aquatic microorganisms during 15-30 days of cultivation.--Copyright 1976, Biological Abstracts, Inc.
W76-08252

DETECTION OF SALTS OF 2,4-D IN AQUEOUS SOLUTION BY LASER RAMAN SPECTROSCOPY,
Kentucky Univ., Lexington. Dept. of Electrical Engineering.
J. M. Reeves, E. B. Bradley, and C. A. Frenzel.
Water Research, Vol. 7, No. 10, p 1417-1429, 1973, 11 fig, 3 tab, 9 ref.

Descriptors: *Analytical techniques, *Spectroscopy, *Pollutant identification, Herbicides, Potassium, Sodium compounds, *2-4-D, Aqueous solutions.
Identifiers: *Laser Raman spectroscopy.

Laser Raman spectroscopy has been used to detect a salt of a herbicide, 2,4-dichlorophenoxy acetic acid, in water solution at concentrations as low as 500 ppm. In this experiment, all spectra were excited with a 50 mW He-Ne gas laser at 6328 angstroms. Lower concentrations should be detectable with a more powerful laser at higher frequency. The Raman spectrum of the powder was substantially different from the spectrum of the pollutant in aqueous solution. The spectrum of the potassium and sodium salts were the same for the powder or aqueous solution. Five strong bands exist in aqueous solution, and four of these bands are detectable at concentrations as low as 500 ppm. The resonance Raman effect is discussed as a possible method for the detection and identification of small optimal concentrations of pollutant in water. (Sandoski-FIRL)
W76-08254

AN IMPROVED METHOD FOR DETERMINATION OF THE CHEMICAL OXYGEN DEMAND WITH POTASSIUM DICHROMATE (COD-METHOD) (EINE VERBESSERTE METHODE ZUR BESTIMMUNG DES CHEMISCHEN SAUERSTOFFBEDARFS MIT KALIUM-DICHROMAT) (COD-METHODE),
D. Maier.
Gas- und Wasserfach, Wasser/Abwasser, Vol. 114, No. 8, p 366-370, 1973. 1 fig, 2 tab, 14 ref.

Descriptors: *Analytical techniques, *Chemical oxygen demand, Groundwater, Surface waters, Sampling, Oxygen, *Pollutant identification.
Identifiers: Potassium dichromate.

An improved method using potassium dichromate for the determination of the chemical oxygen demand of groundwater and surface water samples has been developed. In this process, the water sample to be tested is combined with one gram of mercury sulfate per 50 ml of water, after which 50 ml of chromosulfuric acid are added. The flask then is thermostatized at 140 C for four hours. The test solution is cooled to room temperature, diluted with bidistilled water, combined with two to three drops of ferroin solution, and finally titrated with a standard solution of ammonium-ferrous sulfate until the color shifts from yellow-green across blue-green to reddish brown. The method is suitable from COD determinations within the range of 0.5-200 mg of oxygen per liter. (Nave-FIRL)
W76-08256

MEASUREMENT METHOD FOR DISSOLVED AMMONIA NITROGEN IN WATER (YOZON ANMONIASEI CHISSO NODO SOKUTEIHO),
T. Tamate, H. Nakaya, and A. Tomita.
Japanese Patent Sho 48-11200. Issued April 11, 1973.

Descriptors: *Measurement, *Nitrogen compounds, Methodology, Testing procedures, Colorimetry, Polarographic analysis, *Patents, *Pollutant identification.
Identifiers: *Ammonia nitrogen, Japan.

A patented method was designed to reduce errors in the previous method of measuring ammonia nitrogen residue in liquids using a Nessler reagent and comparing the color of Millon's base with the standard colors of nitrogen solution. Since other substances and color material are dissolved in the test liquid, this measurement method often caused errors. In the new method, an excess but given amount of Nessler reagent is added to the sample liquid and the entire ammonia nitrogen residue in the liquid is made to react. The remaining Nessler reagent concentration is measured by polarography, and thus the concentration of nitrogen residue is indirectly obtained. In using this method, if the nitrogen concentration range is narrow, the Nessler additive may be in a small quantity; however, if the concentration range is broad, the amount of reagent must be large. The reliability of the method is excellent. (Seigle-FIRL)
W76-08261

ABSORPTIOMETRIC DETERMINATION OF IRON WITH T.P.T.Z.,
Water Research Association, Marlow (England).
W. K. Dougan, and A. L. Wilson.
Water Treatment and Examination, Vol. 22, No. 2, p 100-113, 1973. 6 tab, 15 ref.

Descriptors: *Analytical techniques, *Water quality, *Iron, Instrumentation, Measurement, Water quality control, Laboratory tests, *Pollutant identification, Absorption.
Identifiers: *Absorptiometric method, TPTZ.

As demands for better water quality have increased, the need has grown for a convenient and reliable method of measuring down to 0.01-0.05 mg Fe/liter. This design was confined to absorptiometric methods because most water laboratories have the necessary instrumentation. A literature survey indicated that the chromogenic reagent 2,4,6-tri-(2'-pyridyl)-1,3,5-triazin (TPTZ) was suitable; optimum conditions for the use of this reagent were established and the performance of the resulting method determined. Advantages of this method include: good precision derived from the use of TPTZ; rapid and simple performance; and, no interference by substances commonly found in raw and treated waters. (Sandoski-FIRL)
W76-08273

SIMULTANEOUS DETERMINATION OF CU2+, PB2+, CD2+, AND ZN2+ IN FRESH TOWN-WATER BY ANODIC STRIPPING POLARGRAPHY, (IN JAPANESE),
Y. Yamazaki.
Bunseki Kagaku, (Japan Analyst), Vol. 22, No. 6, p 763-770, June, 1973. 9 fig, 6 tab, 13 ref.

Descriptors: *Analytical techniques, Water, Pipes, Polargraphic analysis, Zinc, Lead, Cadmium, Copper, *Pollutant identification, Ions, Separation techniques.
Identifiers: *Anodic stripping polargraphy.

A procedure for the simultaneous determination of Cu+2, Pb+2, Cd+2, and Zn+2 ions in municipal water which has been retained in water pipes for 24 to 72 hours has been developed. The ions are electrodeposited on a Balanced Head Stationary Hanging Mercury Drop Electrode (BHMDE) at -1.5 volt vs. Hg pool for a period of five minutes with stirring at 300 rpm in 0.5 M sodium acetate and 0.1 M potassium tartrate supporting medium. The relationship between the dissolution peak currents and pre-electrolysis potential, the effects of foreign cations on Cd and Pb, and the effects of the surface active substance on the dissolution currents of Cu, Pb, Cd, and Zn were examined. A good linear relationship as obtained by the standard addition method was observed between the concentrations of ions and the wave heights in the range of 0.5 x 10 to the minus 7th power M to 5 x 10 to the minus 7th power M. (Sandoski-FIRL)
W76-08275

A CONTINUOUS METHOD OF MONITORING WATER QUALITY BY CHLORINE CONSUMPTION UNDER ULTRAVIOLET RADIATION. I. DESIGN AND PERFORMANCE TEST OF CONTINUOUS CHLORINE CONSUMPTION METER AND APPLICATION TO RAW WATERS OF A WATER PURIFICATION PLANT, (IN JAPANESE),
T. Okuda, and T. Kobayashi.
Tokyo Kogyo Shikenjo Hokoku, (Report of Government Chemical Industrial Research Inst., Tokyo), Vol. 68, No. 7, p 257-265, July, 1973. 6 fig, 4 tab, 9 ref.

Descriptors: *Analytical techniques, *Water quality, *Ultraviolet radiation, Monitoring, Treatment facilities, Chlorine, Organic compounds, Chemical oxygen demand, Mercury, Chlorination, Irradiation, *Pollutant identification.
Identifiers: Photosensitizers, Lead salts.

A continuous method of monitoring water quality by chlorination consumption under ultraviolet radiation has been developed. Examinations were performed on aqueous solutions of 51 compounds and raw water at a purification plant. Combination of chlorine and ultraviolet light permits far more rapid consumption of chlorine for various organic compounds than does the mere contact of chlorine and organic compounds without light. One disadvantage of using this method is that acetic acid does not consume chlorine even under irradiation. Values were obtained for two groups of compounds, based on the effects of ultraviolet radiation, in terms of COD; only rough differentiation between these two groups was possible. The proportionality and additivity of chlorine consumption data in mixed solutions were obtained only in low substrate concentrations. As the photosensitizers, mercury and lead salts were found to be effective for this method. (See also W72-12652) (Sandoski-FIRL)
W76-08276

A STUDY ON MARINE TRACE ELEMENTS AND CSK STANDARDS, (IN JAPANESE),
Sagami Chemical Research Center, Sagamihara (Japan).
For primary bibliographic entry see Field 2L.
W76-08311

ORGANIC CARBON, PHOSPHORUS AND NITROGEN IN THE WATERS OF THE SEA OF JAPAN, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
S. V. Lyutsarev, and E. A. Romankevich.
Okeanologiya. 15(2), p 261-265, 1975.

Descriptors: Carbon, *Phosphorus, *Nitrogen, Bacteria, Sea water, Pollutant identification, Protozoa, Phytoplankton, Correlation analysis.
Identifiers: *Organic carbon, *Sea of Japan, Bacterioplankton.

Concentrations of dissolved and suspended organic C (Cp and Cb, respectively), P (Pp and Pb, respectively) and suspended organic N (Nb) were determined in 12 seawater samples collected with a 200 l water bottle at a station in the Sea of Japan (June 1972). The weighted mean concentrations for the 0-2000 m layer were: 1.58 mg.l-1 for Cp, 17.9 micrograms.l-1 for Cb, 13.9 micrograms.l-1 for Pp, 0.185 micrograms.l-1 for Pb, 2.7 micrograms.l-1 for Nb, the Cp:Pp ratio was 100:0.9 and Cb:Nb:Pb was 100:14:1. The relationship between Cb and the light attenuation factor epsilon (for the visible part of the spectrum) was described by the equation Cb micrograms.l approx. 170. epsilon m-

1. The Cb concentration maximum in the upper layer was correlated with the maxima of phytoplankton, bacterioplankton and protozoa.--Copyright 1976, Biological Abstracts, Inc.
W76-08313

CORALVILLE WATER QUALITY STUDY, ANNUAL REPORT, WATER YEAR OCTOBER 1, 1974 TO SEPTEMBER 30, 1975,
Iowa University, Iowa City, Inst. of Hydraulic Research.
D. B. McDonald, and M. P. McDonald.
IIHR Report No. 187, February 1976. 80 p, 10 fig, 1 plate, 32 tab, 26 ref. ARMY DACWZ 5-74-C-0007.

Descriptors: *Reservoirs, *Water quality, *Iowa, Rivers, Dams, Pollutants, Water pollution, Agriculture, Nutrients, Groundwater, Geology, Soils, Precipitation(Atmospheric), Runoff, Reservoir operation.
Identifiers: *Coralville Reservoir(Iowa), *Iowa River(Iowa).

Data obtained during the present water year are consistent with the results of earlier studies which indicated that the water quality of the Iowa River and Coralville Reservoir are greatly influenced by two major factors: (1) the intensive agricultural activities in the drainage basin and (2) the hydrological characteristics of the river. In addition, the morphometry and flood control operation of the Coralville Reservoir have a significant effect on the water quality of the Coralville Reservoir and subsequently the Iowa River below the dam. Probably the major factor influencing the water quality of the Iowa River is non-point source pollution from agricultural land. In many instances increased concentrations of several parameters were directly related to increased runoff from the basin. These parameters included turbidity, solids, phosphates, ammonia, total and fecal coliform and fecal streptococcus organisms. In most cases, concentrations of nutrients and bacteria introduced by runoff increased markedly at the beginning of a high flow period and then declined as continued inflow washed these materials from the basin and they became diluted by the high river flows. (Sims-ISWS)
W76-08324

ESTIMATING WATER SALINITY WITH GEOPHYSICAL EARTH RESISTIVITY EQUIPMENT,
Agricultural Research Service, Sidney, Mon.
For primary bibliographic entry see Field 2K.
W76-08332

AN IGNITION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN LAKE SEDIMENTS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
J. M. Andersen.
Water Research, Vol. 10, No. 4, p 329-331, 1976. 3 tab, 11 ref.

Descriptors: *Phosphorus compounds, *Phosphates, *Lake sediments, Analytical techniques, *Bottom sediments, *Pollutant identification, Phosphorus, Water pollution sources, Inorganic compounds, Silts, Soils, Soil types, Analysis, Chemistry, Instrumentation, Organic compounds, Water quality, Chemicals, Digestion, Humus.
Identifiers: Phosphorus determination, *Ignition method, Sediment samples, Biogenic material, Kajak bottom sampler, Perchloric acid method, Plant material.

A method was described for determination of total phosphorus in lake sediments or biogenic material. The organic matter is destructed by ignition. Material remaining after ignition is boiled in 1 N HCl and orthophosphate determined after dilution. The method generally gave lower results than the perchloric acid digestion method (97.7, 98.7, 94.4, 100.5 and 97.3%) for four sediment samples and one sample of dried leaves. The reproducibility of the ignition method was slightly less than that observed with the perchloric acid method. Recovery after addition of known amounts of hydroxylapatite to the sediment samples was 98.5-102.6%. (Henley-ISWS)
W76-08346

A SIMPLE CONTINUOUS-FLOW RESPIROMETER FOR COMPARATIVE RESPIRATORY CHANGES IN MEDIUM-SIZED AQUATIC ORGANISMS,
Texas Christian Univ., Fort Worth. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08353

DETERMINATION OF TOTAL NITROGEN IN NATURAL WATERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W76-08355

CHLORINATED PESTICIDES AND POLYCHLORINATED BIPHENYLS IN MARINE SPECIES, OREGON/WASHINGTON COAST, 1972,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
R. R. Claeys, R. S. Caldwell, N. H. Cutshall, and R. Holton.
Pesticides Monitoring Journal, Vol. 9, No. 1, p. 2-10, 1975. 2 fig, 4 tab, 13 ref. NSF 6X28744, NMF N-042-14-72 (N), DHEW ES00040.

Descriptors: *Mollusks, *Crustaceans, *Pesticide residues, *Marine fish, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Oregon, Washington, Coasts, DDE, DDT, Pink shrimp, Columbia River, Estuaries, Rainbow trout, Mollusks, Salmon, Clams, Aroclors, Dieldrin, *Pollutant identification.
Identifiers: Flatfish, Coos Bay(Ore), Rogue River(Ore), Euphausiids, Tillamook Bay(Ore), Yaquina Bay(Ore), Umpqua River(Ore), Chlordane, Thiodan, Newport(Ore).

Chlorinated pesticides and polychlorinated biphenyls were measured in pink shrimp, euphausiids, and flatfish from the Oregon-Washington coast, five bivalve mollusks from five estuaries along the Oregon coast, several fish species from Coos Bay and Columbia River estuaries, and a summer-run of steelhead salmon from the Rogue River. PCBs and p,p'-DDE were found most frequently. Euphausiids and pink shrimp contained about 2 ppb wet-weight DDE and 8 and 25 ppb PCBs, respectively. Offshore flatfish averaged 9 ppb DDE and 29 ppb PCBs. Estuarine mollusks contained about 0.5 ppb DDE. PCB residues were only detected in samples from the Columbia River mouth where average levels were 400 ppb PCBs and 17 ppb DDT. Some Columbia River species contained 38 ppb DDE and 480 ppb PCBs. Rogue River summerrun steelheads had 97 ppb DDE and 125 ppb PCBs. PCB chromatograms of most euphausiids were similar to those of Aroclor 1254. Chromatograms of shrimp and flatfish showed selective metabolism of two compounds in the Aroclor 1254 formulation. Shrimp and flatfish had biphenyls with higher chlorine contents. Polychlorinated biphenyl contamination of the Columbia River was greater than that of adjacent coastal waters. (Buchanan-Davidson--Wisconsin)
W76-08359

MERCURY CONCENTRATIONS IN FISH, NORTH ATLANTIC OFFSHORE WATERS--1971,
National Marine Fisheries Service, Milford, Conn. Milford Lab.
R. A. Greig, D. Wenzloff, and C. Shelpuk.
Pesticides Monitoring Journal, Vol. 9, No. 1, p. 15-20, 1975. 1 fig, 7 tab, 9 ref.

Descriptors: *Mercury, *Marine fish, *Atlantic Ocean, Plankton, Sediments, Invertebrates, Pollutant identification.
Identifiers: North Atlantic Ocean.

Mercury concentrations in groundfish collected from United States waters of the North Atlantic Ocean were determined as part of a program to study effects of chemical contamination on biological marine resources. Mercury levels were measured in muscles and livers of 41 fish species, plankton, sediment, and invertebrates all collected in 1971. The average mercury concentrations were 0.154 ppm in fish muscle and 0.164 ppm in fish liver. Mercury concentrations were usually similar among individuals of most species, but variations were observed in cusk (0.13-1.33 ppm in livers and 0.15-0.59 ppm in muscles) and spiny dogfish (0.14-0.93 ppm). Feeding habits and mercury concentrations could not be correlated. The highest levels were found in the muscles of cusk, spiny dogfish, northern searobin, and striped searobin and the livers of blackbelly rosefish, cusk, northern searobin, and American shad. Similar concentrations of mercury were found in muscles and livers of most species; exceptions were higher levels in muscles of spiny dogfish and livers of blackbelly rosefish, American shad, and Atlantic herring. Invertebrate samples generally contained less than 0.1 ppm mercury. The nine plankton and 10 sediment samples had less than 0.05 ppm. Pandallis shrimp, scallops, and squid usually had levels below 0.05 ppm. (Buchanan-Davidson--Wisconsin)
W76-08360

CONSIDERATIONS OF TESTING THE ACCUMULATION OF PESTICIDES BY MEANS OF ARTIFICIAL FOOD CHAINS,
Hamburg Univ. (West Germany). Institut fuer Hydrobiologie und Fischereiwissenschaft.
K. Lillelund.
Ber Dtsch Wiss Komm Meeresforsch. 23(3), p 308-316, 1974.

Descriptors: *Pesticide residues, *Food chains, *Testing procedures, Pesticide kinetics, Kinetics, Water pollution effects, *Pollutant identification.
Identifiers: Dunaliella, Artemia-Salina, Tilapia-Zillii.

Problems associated with the development of experimental food chains for testing pesticide accumulation are discussed. Attention is directed especially to the ways of accumulation, criteria for selecting organisms for a test chain, structure of a test chain, the basis for the calculation of and definitions for the concentration factors Cw, Cf, Ct, pesticide concentrations for test purposes, duration of tests, kinetics of accumulation, density of algae in cultures, and the physiological conditions of test organisms. As an example, the artificial food chain Dunaliella-Artemia salina-Tilapia zillii is presented.--Copyright 1975, Biological Abstracts, Inc.
W76-08361

ELECTROPHYSIOLOGICAL STUDIES OF MORPHOLINE-IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH) AND RAINBOW TROUT (SALMO GAIRDNERI),
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08438

EXPERIMENTAL CONFIRMATION OF THE OLFACTORY HYPOTHESIS WITH HOMING, ARTIFICIALLY IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH),
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08439

EFFECTS OF LOW CONCENTRATIONS OF OIL ACCOMMODATED IN SEA WATER ON THE GROWTH OF UNIALGAL MARINE PHYTOPLANKTON CULTURES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W76-08440

CHANGES IN BLOOD CHEMISTRY AND BLOOD CELL MORPHOLOGY IN COHO SALMON (ONCORHYNCHUS KISUTCH) FOLLOWING EXPOSURE TO SUBLETHAL LEVELS OF TOTAL RESIDUAL CHLORINE IN MUNICIPAL WASTEWATER,
Municipality of Metropolitan Seattle, Wash. Water Quality Lab.
For primary bibliographic entry see Field 5C.
W76-08442

THE ACUTE TOXICITY OF DISSOLVED ELEMENTAL PHOSPHORUS TO COD (GADUS MORHUA),
Imperial Chemical Industries Ltd., Bixham (England). Brixham Research Lab.
For primary bibliographic entry see Field 5C.
W76-08450

UPTAKE AND ACCUMULATION OF COPPER AND NICKEL BY METAL TOLERANT STRAINS OF SCENEDESMUS,
For primary bibliographic entry see Field 5C.
W76-08452

THE INFLUENCE OF WATER QUALITY ON ACCUMULATION OF HEAVY METALS IN AQUATIC ORGANISMS,
For primary bibliographic entry see Field 5C.
W76-08456

TOXIC CONSTITUENTS IN PULP MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
J. M. Leach, and A. N. Thakore.
Paper Trade Journal, Vol. 157, No. 41, p 43, October 8, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Pollutant identification, Toxicity, Gas chromatography, Mass spectrometry, Bioassays, Analytical techniques, Fish toxins, Pulp wastes.
Identifiers: Fatty acids, Resin acids.

Research conducted to isloate and identify all the toxic constituents in certain pulp and paper process streams has shown that resin acids and fatty acids are major causes of effluent toxicity. The toxic constituents were concentrated and fractionated primarily by chromatographic techniques. Final characterization of individual toxic components was performed by combination gas chromatography and mass spectrometry. At each stage of the isolation procedure, bioassays were performed on separated and recombined chemical fractions to ensure that the original effluent toxicity was fully accounted for. This analytical method can be used to determine the concentration of individual effluent constituents that are known to be toxic to fish. (Sandoski-FIRL)
W76-08458

DETERMINATION OF TRACES OF CARBON IN SOLID AND LIQUID WASTES OF CHEMICAL PLANTS BY MEANS OF THERMAL CONDUCTIVITY MEASUREMENTS (BESTIMMUNG VON SPUREN KOHLENSTOFF IN FESTEN UND FLUESSIGEN ABFALLSTOFFEN DER CHEMISCHEN INDUSTRIE MIT HILFE DER WAERMELEITFAEHIGKEITSMESSUNG),
Farbwerke Hoechst, Frankfurt am Main (West Germany).
F. Ehrenberger.
Zeitschrift fuer Analytische Chemie, Vol. 267, p 17-21, 1973. 1 fig, 1 tab, 7 ref.

Descriptors: *Pollutant identification, *Waste water treatment, *Industrial wastes, *Thermal conductivity, Analytical techniques, Chemical wastes, Chemical industry, Measurement, Carbon dioxide.

An analytical technique designed for the determination of traces of carbon in solid and liquid wastes of chemical plants is described. In this method, the samples are converted by tube-burning. During the conversion, carbon dioxide is adsorbed on a molecular sieve, and then set free and measured by thermal conductivity. The data are digitally encoded for readout and further processing. (Sandoski-FIRL)
W76-08499

DETERMINING OIL CONTENT, IN WATER.
Netherlands Patent NL 7302932. Issued October 1, 1973. Derwent Netherlands Patents Reports, Vol. U, No. 42, p J1, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, *Patents, Oily water, *Oil wastes, Analytical techniques, Measurement, Filtration, *Pollutant identification.
Identifiers: Photoelectric device, Dielectric constant, Polypropylene wool.

A process for determining the oil content in water has been patented. In this method, oil is concentrated by passing a definite amount of water per unit time through a definite surface of a filter material which absorbs or separates the oil. A photoelectric device determines the color change of the oil-absorbing filter material after the passage of the water. The degree of color change is used as a measure of the oil content, or, the dielectric constant of the oil-absorbing filter material can be determined after the passage of the water, and the measurement used to determine the oil content. The water is passed twice through the filter material, polypropylene wool, in opposite flow directions so that the greater part of the rust and solid particles is removed from the filter material, while the oil remains in the filter material. The process is capable of determining oil concentrations even when the oil/water ratio is below 1/100,000. (Sandoski-FIRL)
W76-08501

MERCURY IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08526

ENVIRONMENTAL MONITORING FROM SPACECRAFT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
R. H. Rogers, C. L. Wilson, L. E. Reed, N. J. Shah, and R. Akeley.
Available from the National Technical Information Service, Springfield, Va 22161, as N75 26466, $3.50 in paper copy, $2.25 in microfiche. Special Report BSR 4183, June 1975. 10 p, 4 fig, 8 ref. NASA NAS5-20942.

Descriptors: *Pollutant identification, *Remote sensing, *Land use, *Drainage area, Lakes, Rivers, Model studies, Maps, Costs, Water quality, Water pollution, Satellites(Artificial), Data processing, Federal Water Pollution Control Act, Computer programs, Analytical techniques.
Identifiers: *LANDSAT, *ERTS.

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 provided the opportunity and funding to fight water pollution through the use of regional water quality planning. A common requirement of the 208 program is to develop a capability of predicting water quality in the rivers and lakes resulting from existing and potential land-use policies. To achieve this capability, the Ohio-Kentucky-Indiana (OKI) Regional Council of Governments is developing a deterministic model capable of predicting sediment and nutrient flow into the waterways. An essential input to OKI's model is an accurate map of land use within the watersheds. This information was obtained by OKI through the machine processing of LANDSAT-1 digital tapes. Computer tabulations were generated to obtain area covered by each of 16 land-use categories within 225 drainage areas. The 16 categories were merged into 10 categories and mapped at a scale of 1 in = 5,000 ft with detail to 1.1 acres for the 2,700-sq mi region. The map products and data were produced within a period of less than 90 days at a cost of $20,000, a significant improvement in dollars and time over conventional mapping techniques. (Sims-ISWS)
W76-08532

REASSESSMENT OF MERCURY IN SURFACE WATER IN THE ADIRONDACK REGION, NEW YORK,
Geological Survey, Ithaca, N.Y.
For primary bibliographic entry see Field 2K.
W76-08554

SELECTED HYDROLOGIC DATA, CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-08557

GEOLOGY AND WATER RESOURCES OF MARSHALL COUNTY, SOUTH DAKOTA--PART 1: GEOLOGY AND WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-08558

DISTRIBUTION AND MOVEMENT OF ZINC AND OTHER HEAVY METALS IN SOUTH SAN FRANCISCO BAY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-08561

WATER QUALITY IN THE MAD RIVER BASIN, HUMBOLDT AND TRINITY COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. H. Fuller.
Available from the National Technical Information Service, Springfield, Va., 22161, as ADAO 23722 , $4.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 44-75, December 1975. 54 p, 21 fig, 15 tab, 17 ref.

Descriptors: *Water quality, *Pre-impoundment, *Baseline studies, *California, River basins, Water analysis, Chemical analysis, Surface waters, Groundwater, Nutrients, Coliforms, Dissolved oxygen, Trace elements.
Identifiers: *Mad River(Calif).

The Mad River of north-coastal California has been the proposed site of the Butler Valley Dam and Blue Lake Project. This report presents the results of a study of surface-water and groundwater quality in the Mad River basin from 1970 through 1974. The general chemical quality of both groundwater and surface water is acceptable for domestic and industrial uses after limited treatment to remove dissolved iron from the water. Nitrogen, phosphorus, and carbon nutrients were found in the river in quantities sufficient to promote algal growth. These nutrients, when combined with water temperatures reaching 25 deg C

in the summer, could result in algal blooms in the proposed reservoir. No measurable concentrations of pesticides were found in the river sediment or water, and concentrations of trace metals were very low. Diel studies showed a slight dissolved-oxygen sag at night, near river bottom, which is attributed to consumption of oxygen by algae. Biologically the river is of high quality with a diverse macroinvertebrate population. Periphyton in the river was predominantly Cladophora sp. Diatoms composed most of the phytoplankton population. Fecal coliform counts were less than 20 colonies per 100 millilitres, indicating no significant source of fecal pollution in the reaches of the river studied. (Woodard-USGS)
W76-08562

DATA ON SELECTED LAKES IN WASHINGTON, PART 3,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08564

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 3. KITSAP, MASON, AND PIERCE COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08565

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 4. CLARK, COWLITZ, GRAYS HARBOR, LEWIS, PACIFIC, SKAMANIA, AND THURSTON COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08566

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 5. CHELAN, FERRY, KITTITAS, KLICKITAT, OKANOGAN, AND YAKIMA COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08567

AMINO ACIDS AND GASES IN SOME SPRINGS AND AN OIL FIELD IN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-08568

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN BRAZORIA, FORT BEND, AND WALLER COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08569

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1970-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08570

CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS, A SELECTED, ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Information Center.
For primary bibliographic entry see Field 5C.
W76-08592

SAVANNAH RIVER BIOLOGICAL SURVEY, LOWER THREE RUNS.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08593

SAVANNAH RIVER BIOLOGICAL SURVEY.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08594

REFERENCE METHODS FOR MARINE RADIOACTIVITY STUDIES II.
International Lab. of Marine Radioactivity, Vienna (Austria).
IAEA, Vienna, Austria, Technical Reports Series No. 169, 1975. 239 p, 113 ref.

Descriptors: *Analytical techniques, *Radiochemical analysis, Radioisotopes, Ruthenium, Zirconium, Silver, Iodine, Surveys, Pollutant identification, Chemical analysis.

Results are reported of a survey which critically examined the present status of analytical methods for transuranic elements radioruthenium, radiozirconium, radiosilver, and radioiodine. The panel performing the survey felt that it should not attempt to recommend standard methods for the radionuclides in question, but to indicate the advantages and pitfalls in existing analytical methods to assist researchers in judging the suitability of the methods for monitoring and for research. In addition to the above mentioned methods, the volume contains 19 supporting papers to the report. (See also W76-08609 thru W76-08627) (Chilton-ORNL)
W76-08608

QUALITY CONTROL IN RADIOCHEMICAL ANALYSIS,
New York Operations Office (AEC), N. Y. Health and Safety Div.
J. H. Harley, H. L. Velchek, and V. T. Bowen.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 63-68, 1 tab.

Descriptors: *Radiochemical analysis, *Quality control, Radioisotopes, Analytical techniques.

A review of the overall requirements for quality control in the particular case of low level radiochemical analysis is presented. The basic factors affecting the quality of radiochemical analysis are given as (a) the use of proper standards for calibration, (b) the use of proper counter efficiencies and backgrounds, (c) the proper determination of radiochemical recovery, (d) correction of results for analytical blank, and (e) the continual checking of the performance of the overall system for accuracy and precision. (See also W76-08608) (Chilton-ORNL)
W76-08609

DOUBLE-TRACER STUDIES TO OPTIMIZE CONDITIONS FOR THE RADIOCHEMICAL SEPARATION OF PLUTONIUM FROM LARGE SEAWATER SAMPLES,
Woods Hole Oceanographic Institution, Mass.
H. D. Livingston, D. R. Mann, and V. T. Bowen.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p69-76, 2 tab, 11 ref.

Descriptors: *Radiochemical analysis, *Plutonium, *Sea water, *Separation techniques.
Identifiers: Double-tracer studies.

By using two tracers of a single element as yield-monitors, adding one at late steps in a sequential procedure, it is possible to examine the conditions affecting efficiency at each step. This is illustrated in experiments optimizing the procedure for plutonium in seawater, using Pu242 and Pu236 for double tracer studies. Data show that the recovery of plutonium from the seawater increased with the amount of iron carrier used. Plutonium was oxidized to the 4+ state with hydrogen peroxide and adsorbed with high efficiency on anion exchange resin from strong nitric or hydrochloric acid media. Studies of the electroplating method indicated that better recoveries resulted from the use of an ammonium sulphate rather than an ammonium chloride medium with longer plating times and lower current. (See also W76-08608) (Chilton-ORNL)
W76-08610

A PROCEDURE FOR ANALYSIS OF AMERICIUM IN MARINE ENVIRONMENTAL SAMPLES,
Woods Hole Oceanographic Institution, Mass.
R. Bojanowski, H. D. Livingston, D. L. Schneider, and D. R. Mann.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 77-86, 1 fig, 3 tab, 8 ref. AT(11-1)-3563, AT(11-1)-3568.

Descriptors: *Radiochemical analysis, *Americium, *Analytical techniques, Separation techniques.

An alpha-emitting radiotracer, Am243, is used to measure the radiochemical yeild of Am241 separated from a sample. A lanthanide carrier is used in preliminary concentration of americium from sample matrix elements. After the concentration steps, the lanthanide/americium fraction is radiochemically purified by ion exchange from alpha-emitting isotopes of the natural radioactive series. An anion exchange method based on the difference in adsorption from thiocyanate media between americium and the lanthanides is used to separate the americium from the lanthanide carrier. The americium is stripped from the resin with hydrochloric acid and subjected to an additional thiocyanate column treatment. The americium is pure enough at this stage to be electroplated after destruction of residual thiocyanate eluted with americium. The activity of Am241 and the Am243 yield monitor are then measured using a high resolution surface barrier detector. Data are given to show the accuracy and precision of the method and an extensive series of notes discusses the various steps. (See also W76-08608) (Chilton-ORNL)
W76-08611

ISOTOPIC ANALYSIS OF PLUTONIUM IN ENVIRONMENTAL SAMPLES BY ISOTOPE DILUTION MASS SPECTROMETRY,
California Univ., Livermore. Lawrence Livermore Lab.
R. J. Dupzyk, R. D. Carver, and I. A. Dupzyk.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 87.

Descriptors: *Radiochemical analysis, *Plutonium, Spectrophotometry, Analytical techniques, Mass spectroscopy.

A technique is presented with which, using careful attention to cleanliness of chemical operations it is possible to obtain reliable and accurate results for samples containing less than 0.1 picogram of total plutonium. The method has been applied to isotopic analysis of plutonium that was isolated from soils, air filters, seawater, marine organisms, and urine. Origin and size of original sample appear to have little bearing on the accuracy of mass analyses. (See also W76-08608) (Chilton-ORNL)
W76-08612

PROCEDURE FOR PLUTONIUM ANALYSIS OF LARGE (100 G) SOIL AND SEDIMENT SAMPLES,
California Univ., Livermore. Lawrence Livermore Lab.
J. W. T. Meadows, J. S. Schweiger, B. Mendoza, and R. Stone.

In: Reference Methods for Marine Radioactivity Studies II, 1975. p 89-90.

Descriptors: *Radiochemical analysis, *Plutonium, Analytical techniques, Sediments, Soils.

The paper describes a procedure which is in routine usage at Lawrence Livermore Laboratory for the analysis of fall-out levels of Pu in soils and sediments. The procedure involves complete dissolution of the sample. Data obtained by this technique were compared with results obtained by use of a leach technique. For most of the samples, the results using complete dissolution were 30-50% higher than those using the leach method. (See also W76-08608) (Chilton-ORNL)
W76-08613

RADIOCHEMICAL DETERMINATION OF PLUTONIUM IN MARINE SAMPLES BY ION EXCHANGE AND SOLVENT EXTRACTION,
Danish Atomic Energy Commission, Risoe. Research Establishment; and Danish Atomic Energy Commission, Roskilde. Health Physics Dept.
A. Aarkrog.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 91-96, 3 fig, 7 ref.

Descriptors: *Radiochemical analysis, *Plutonium, Sea water, Sediments, Analytical technique, *Solvent extractions, *Ion exchange.

The procedure involves the ashing of solid samples at 600 degrees C, adding Pu236 and iron, mixing of potassium pyrosulphate in the ratio of 3:1 and melting of the mixture. This treatment brings the oxidation stage of Pu to 4+ and all Pu into soluble form. The Pu and iron scavenger are precipitated as hydroxide and then separated on an anion exchange resin. The Pu is extracted with 1-phenyl-3 methyl-4-benzoyl-pyrazolone-5 in xylene and the organic phase containing the Pu is evaporated on a steel planchet, ignited and counted on a silicon surface barrier alpha counter connected to a multichannel analyser. In the case seawater the first step is a coprecipitation with ferrous hydroxide with concentrated ammonium hydroxide. (See also W76-08608) (Chilton-ORNL)
W76-08614

DETERMINATION OF PLUTONIUM IN THE MARINE ENVIRONMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
K. C. Pillai.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 97-105, 6 tab, 26 ref.

Descriptors: *Radiochemical analysis, Radioisotopes, Marine biology, Environmental effects, *Plutonium, Strontium, Ruthenium, Cesium, Cerium, Analytical techniques, *Separation techniques.

Analytical methods for the separation of Pu from marine samples are discussed. These methods involve coprecipitation, complexation, solvent extraction and ion exchange. Samples of seawater collected from the Trombay discharge area in Bombay Harbour were analyzed. Examination of bottom sediments in the bay show that most of the plutonium gets accumulated in the discharge locations and its close neighborhood. Accumulation of Ru106, Ce144 and Cs137 are very high in the benthic organisms, but the levels of plutonium are relatively low. A comparison of the data on sediments and organisms show that sediments play a major role in the removal of plutonium from seawaters. (See also W76-08608) (Chilton-ORNL)
W76-08615

RESULTS OF PLUTONIUM INTERCALIBRATION IN SEAWATER AND SEAWEED SAMPLES,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
R. Fukai, and C. N. Murray.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 107-120, 4 tab, 3 ref, 33 append.

Descriptors: *Radiochemical analysis, *Plutonium, Sea water, Marine algae, *Analytical techniques, Inter-agency cooperation, *Calibration.

The intercalibration exercise was initiated when it became clear that controversial opinion existed among different laboratories concerning the suitable analytical procedures for transuranic elements, especially Pu238 and Pu239. Pu238 and Pu239 was measured in two seawater samples and one marine algae sample by seventeen laboratories from 8 countries and the IAEA International Laboratory of Marine Radioactivity. In spite of the complicated chemical procedures involved in plutonium analysis, the scatter of the reported results was much smaller than that for fission product radionuclides such as strontium 90, ruthenium 106, and cesium 137. On the basis of the results obtained it was suggested that a repeat of this type intercalibration exercise be made in the future with emphasis on the determination of americium 241 and other transuranic radionuclides. (See also W76-08608) (Chilton-ORNL)
W76-08616

METHODS OF RUTHENIUM 106 ANALYSIS IN MARINE ENVIRONMENTAL SAMPLES, - A REVIEW,
Institute of Public Health, Tokyo (Japan). Dept. of Radiological Health.
M. Shiozaki.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 121-136, 2 tab, 53 ref, 1 append.

Descriptors: *Radiochemical analysis, *Spectrophotometry, *Ruthenium, Sea water, Sediments, Biota, Aquatic life, *Reviews.

The paper reviews the various analytical methods in current use for the determination of Ru 106 in seawater, marine biota, and sediments. Comparisons of various methods are made as well as conclusions concerning gamma spectrometry and radiochemical procedures in all three types of samples. An appendix presents procedures which are recommended by the authors. (See also W76-08608) (Chilton-ORNL)
W76-08617

DETERMINATION OF RADIONUCLIDES OF CE, CO, FE, RU, ZN AND ZR IN SEAWATER BY PRECONCENTRATION OF COLLOIDAL MANGANESE DIOXIDE, APPLICATION TO THE DETERMINATION OF LOW LEVEL RUTHENIUM 106,
Commissariat a l'Energie Atomique, Cherbourg (France). Centre de la Hague.
P. Guegueniat, R. Gandon, and Y. Lucas.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 137-145, 3 fig, 3 tab, 9 ref.

Descriptors: *Radiochemical analysis, *Ruthenium, Sea water, Chemical precipitation, Radioisotopes.

The precipitation of manganese dioxide in the seawater medium offers a preconcentration method that is simple and immediately applicable after sample collections. The method can be used for the determination of a number of such trace elements occurring in seawater as cerium, cobalt, copper, iron, nickel, tin, zinc, and zirconium. For ruthenium this method can also be used under the following conditions: for small volumes of seawater heat to 90 degrees C to speed up fixation; for large samples this is impractical and the precipitate should be allowed to be in contact with the solution at room temperature for three weeks. The application of this preconcentration procedure to monitoring situations was tested and proved to be satisfactory. (See also W76-08608) (Chilton-ORNL)
W76-08618

RADIORUTHENIUM IN COASTAL WATERS,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
K. C. Pillai, and N. N. Dey.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 147-154, 7 tab, 8 ref.

Descriptors: *Water pollution, *Radioisotopes, *Sea water, *Water wells, *Ruthenium, Radiochemical analysis, Analytical techniques.

Investigations of the well water and bay water near the Trombay Fuel Reprocessing Plant were made. It was found that the mobile form of ruthenium was present in the well water. 94.98% of the activity in the well water was anionic. The distribution of radioruthenium in seawater, suspended silt, bottom sediments, and organisms collected from areas close to the effluent discharge location showed that only very low levels of Ru106 was found in seawaters while ruthenium in the silt was high. Shore and bottom sediments with high concentrations of radioruthenium were confined to the discharge location. It was determined that about 75% of the radioruthenium in seawater exists in the anionic form and about 25% in the cationic form. (See also W76-08608) (Chilton-ORNL)
W76-08619

A REVIEW OF METHODS FOR THE DETERMINATION OF RADIOACTIVE AND STABLE ZIRCONIUM IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 155-162, 3 fig, 1 tab, 59 ref.

Descriptors: *Radiochemical analysis, *Zirconium, Sea water, Radioactive wastes, Fallout, Radioisotopes, Analytical techniques, Water pollution, *Reviews.

The only important radioactive nuclide of zirconium encountered in the marine environment is Zr95. Analytical methods for the determination of this radionuclide which are suitable in the context of radioactive waste disposal are given particular attention in this review. Direct gamma-spectrometric analysis of the dried material is generally suitable in this context but multinuclide analysis of seawaters involves either the processing of large volumes of sample, or the use of complex detection systems, or both. It was concluded that recourse may have to be made to the separation of Zr95 alone. (See also W76-08608) (Chilton-ORNL)
W76-08620

A REVIEW OF METHODS FOR THE DETERMINATION OF RADIOACTIVE AND STABLE SILVER IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 163-172, 4 tab, 2 fig, 61 ref.

Descriptors: *Analytical techniques, *Silver, Radioisotopes, *Radiochemical analysis, Spectrophotometry, Sea water, Radioactive wastes, *Reviews.

Only Ag108m and Ag110m are likely to be encountered in the marine environment. Some form of gamma-spectrometry is the preferred technique for the analysis of both of these radionuclides in the context of both waste control and research. Chemical separations are generally not necessary, but can be used if required to increase sensitivity and decrease interference. The determination of stable silver in the marine environment is effected by several techniques, with neutron activation the most popular. (See also W76-08608) (Chilton-ORNL)
W76-08621

A REVIEW OF METHODS FOR THE DETERMINATION OF IODINE-131 IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 173-176, 1 tab, 11 ref.

Descriptors: *Radiochemical analysis, *Analytical techniques, *Iodine, Sea water, *Radioisotopes, Spectrophotometry.

For biological materials direct gamma-spectrometric analysis of wet or oven-dried material is satisfactory, producing data with adequate precision down to I131 levels of 0.1 pCi/g or less. Standard methods for the determination of radioiodine in natural waters rely on carrier equilibration, by oxidation to iodate and reduction to iodide, followed by conversion to free iodine and extraction into carbon tetrachloride; the iodine is back-extracted into the aqueous phase and precipitated as silver iodide for subsequent counting. (See also W76-08608) (Chilton-ORNL)
W76-08622

A RAPID METHOD FOR THE DETERMINATION OF RADIOIODINE IN SUSPENDED MATTER AND SEAWATER,
Central Lab. for Radiological Protection, Warsaw (Poland).
S. Wlodek.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 177.

Descriptors: *Analytical techniques, *Spectrophotometry, *Iodine, *Radiochemical analysis, Sea water.

The method measures the inorganic form of iodine and involves the separation of the iodine from other components in the sample by solvent extraction using carbon tetrachloride, and the collection of the iodine on an ion-exchange resin. The form of this resin permits direct measurement of the radioiodine with high sensitivity using beta-spectrometry with anticoincidence shielding. The analysis takes about one hour. (See also W76-08608) (Chilton-ORNL)
W76-08623

A METHOD FOR THE RAPID ENRICHMENT AND DETERMINATION OF SILVER-110M AND IODINE-131 FROM SEAWATER,
Deutsches Hydrographisches Institut, Hamburg (West Germany).
H. F. Eicke.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 179-185, 4 fig, 1 tab, 9 ref.

Descriptors: *Radiochemical analysis, *Silver, *Iodine, Analytical techniques, Sea water.

The seawater to be investigated is slowly drawn off over solid silver iodide, which, to increase the exchange capacity of the surface, is deposited on asbestos fibers. The isotope exchange on AgI permits a relatively rapid concentration an specific selection of Ag-110m from seawater. The time required depends on the quantity of water used for the exchange. The run-through speed was about 200-250 ml/min. The limit of detection was 2 pCi/l using at least 20 litres of seawater. The quantity of water and the measuring time required decrease with higher activities. (See also W76-08608) (Chilton-ORNL)
W76-08624

A STUDY OF THE STABILITY OF SOME RADIONUCLIDES IN SEAWATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton, R. D. Ibbett, and L. E. Woolner.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 187-211, 17 tab, 3 fig, 8 ref, 2 append.

Descriptors: *Radiochemical analysis, *Ruthenium, *Zirconium, *Cerium, Stability, Analytical techniques, Radioisotopes, Sea water.

For the particular environment investigated there were no significant losses of Ru 106 and Zr 95 in filtered seawater from a variety of containers and at pH levels between 1.8 and about 8 the natural pH of seawater. No suitable storage conditions were established for Ce 144. Two appendix outline the procedures for the determination of Ru 106, Zr 95, and Ce 144 in seawater. (See also W76-08608) (Chilton-ORNL)
W76-08625

INTERCALIBRATION OF METHODS FOR RADIONUCLIDE MEASUREMENTS ON A SEAWEED SAMPLE,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
R. Fukai, and S. Ballestra.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 213-233, 11 tab, 3 fig, 5 ref, 1 append.

Descriptors: *Radiochemical analysis, *Radioisotopes, *Inter-agency cooperation, Aquatic algae, Analytical techniques.

Forty-seven laboratories participated in the intercalibration exercise. Reported results on Sr 90 and Cs 137 were generally comparable but there was a large variation in the results reported on K 40, Ru 106, and Ce 144. The majority of results in the latter group had been obtained using non-destructive gamma-spectrometry with Ge(Li) detectors indicating that emphasis should be placed on control of calibration procedures of counting instruments. Probable concentrations estimated on the basis of statistical treatments of reported results are given for K 40, Sr 90, Ru 106, Cs 134, Cs 137, Ce 144, Co 60, Zn 65, Zr-Ni 95, and Ag 110m. (See also W76-08608) (Chilton-ORNL)
W76-08626

RADIOACTIVITY IN THE HYDROSPHERE RECENT TRENDS IN CZECH STUDIES,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
A. Mansfeld.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 235-239.

Descriptors: *Radiochemical analysis, *Radioisotopes, Analytical techniques, Radioactivity, Europe.

The Czech study program obtains information on the behavior of radioactive substances in water courses, reservoirs, sources of drinking water and purification plants. The study was directed mainly at the determination of total beta and Sr 90 activity; Ra226 and uranium activities were also measured. Factors that limit both the extent and the quality of work on the behavior of radionuclides in the hydrosphere are the reproducibility and applicability of the results of radiochemical analyses. A review of the state of the art of methods of determination is presented. (See also W76-08608) (Chilton-ORNL)
W76-08627

BIOCHEMICAL STUDIES OF ENTRAINED PHYTOPLANKTON AT THE MORGANTOWN MARYLAND POWER PLANT,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W76-08642

BASELINE CONCENTRATIONS OF POLYCHLORINATED BIPHENYLS AND DDT IN LAKE MICHIGAN FISH, 1971,
National Water Quality Laboratory, Duluth, Minn.
G. D. Veith.
Pesticides Monitoring Journal, Vol. 9, No. 1, p. 21-29, 1975. 2 fig., 3 tab., 24 ref.

Descriptors: *Baseline studies, *Polychlorinated biphenyls, *DDT, *Lake Michigan, *Fish, Aroclors, Pesticide residues, Legislation, Smelts, Lake trout, Suckers, Carp, Salmon.
Identifiers: Coho salmon, Bloaters.

Organochlorine compounds, especially polychlorinated biphenyls and DDT, in Lake Michigan fish in 1971 were identified and measured quantitatively to establish baselines for predicting trends and gauging legislative impact on lake quality. Thirteen fish species were analyzed. Mean net weight concentrations of polychlorinated biphenyls similar to Aroclor 1254 ranged from 2.7 ppm in rainbow smelt to 15 ppm in lake trout. Polychlorinated biphenyl levels increased with tissue fat percentages and fish size. Polychlorinated biphenyl concentrations varied, limiting usefulness of mean concentrations. DDT concentrations ranged from 1 ppm in suckers to 16 ppm in large lake trout. The ratio of polychlorinated biphenyls to total DDT ranged from 1.3 in redhorse suckers to 7.6 in carp; most ratios were between 1.7-2.8. The most abundant polychlorinated biphenyls were tetra-, penta-, hexa-, and heptachlorobiphenyls; lesser CPB's were present in fish from nearshore areas. Lake Michigan coho salmon contained more polychlorinated biphenyls than those from other Great Lakes. Almost 100% of Lake Michigan large salmon and trout and 50-80% of bloaters contained more polychlorinated biphenyls than FDA tolerance levels. (Buchanan-Davidson--Wisconsin)
W76-08685

MICROBIAL ATP AND ORGANIC CARBON IN SEDIMENTS OF THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08687

PHOSPHORUS FLUX AND CYCLING IN ESTUARIES,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
For primary bibliographic entry see Field 5C.
W76-08689

CAUSES AND PROBABLY CORRECTIVES FOR OXYGEN DEPLETION FISH KILLS IN THE DICKINSON BAYOU ESTUARY: A FIELD STUDY AND SIMPLIFIED ALGAL ASSAY,
Texas Parks and Wildlife Dept., Seabrook. Seabrook Marine Lab.
For primary bibliographic entry see Field 5C.
W76-08690

THE SIGNIFICANCE AND VARIATION OF ATMOSPHERIC NUTRIENT INPUTS IN A SMALL CATCHMENT SYSTEM,
Sheffield Univ. (England), Department of Geography.
R. Cryer.
Journal of Hydrology, Vol. 29, No. 1/2, p 121-137, March 1976. 2 fig, 9 tab, 25 ref.

Descriptors: *Nutrients, *Precipitation(Atmospheric), Peat, *Water quality, Specific conductivity, Calcium, Meteorological data, Streamflow, Sampling, Seasonal Atmosphere, Hydrogen ion concentration, Biochemistry, *Air pollution effects.
Identifiers: *Nutrient input, *Wales, *Atmospheric nutrients, Plant macro-nutrients, Bulk precipitation.

Bulk precipitation and streamflow were sampled for 77 weeks in a 54-haupland peat catchment in Mid-Wales, and seven water quality variables were determined for each sample: specific conductivity and pH, and calcium, magnesium, sodium, potassium and chloride concentrations. Precipitation quality proved to be highly variable from week to week with levels up to ten times the mean value for the period. A seasonal variation in quality was noted, all the variables except Ca(+2) and pH having peak levels in February with below-average values in June to October. The variability in solute levels in precipitation was related to the prevailing meteorological sampling conditions with little success except in supporting the terrestrial source for Ca(+2). Mean solute concentrations in streamwater were higher than in precipitation in every case except for Ca(+2). Occasional individual precipitation samples had higher concentrations than the contemporaneous streamwater samples. Solute rating curves were of very low statistical significance; streamwater solute concentrations were more closely related to solute concentration in the previous week's rainfall. Budget calculations showed that Mg(+2), Na(+), K(+), and Cl(-) in bulk precipitation accounted for 51, 62, 63 and 56%, respectively, of the total element output from the catchment in streamflow. (Roberts - ISWS)
W76-08728

5B. Sources Of Pollution

AN OPTIMIZATION MODEL FOR REGIONAL WATER QUALITY MANAGEMENT,
Lehigh Univ. Bethlehem, Pa. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-08104

MARINE ECOLOGY OF THE NORTHERN EUBOEA: I. PRELIMINARY DATA ON THE ZOOPLANKTON AND THE ICHTYOPLANKTON, (IN FRENCH),
Athens Univ. (Greece). Zoological Lab. and Museum.
For primary bibliographic entry see Field 2L.
W76-08106

GROUND WATER FLOW NO LONGER A MYSTERY,
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 2F.
W76-08114

NUTRIENT AND SEDIMENT CHARACTERISTICS OF TILE EFFLUENT IN OHIO,
Ohio State Univ. Columbus. Dept. of Agricultural Engineering.
T. J. Logan, and G. O. Schwab.
Journal of Soil and Water Conservation, Vol. 31, No. 1, p 24-27, January-February 1976. 2 fig, 4 tab, 12 ref.

Descriptors: *Tile drains, *Nutrients, *Sediments, *On-site investigations, *Ohio, *Drainage systems, Corn(Field), Alfalfa, Fertilizers, Effluents, Agriculture, Pollutant identification, Sampling, Drainage, Path of pollutants.
Identifiers: *Tile effluent, Nutrient losses.

A prominent environmental concern in recent years has been agriculture's contribution to the nutrient enrichment of lakes and streams. The tile effluents were monitored from three small drainage systems - 7 to 10 acres - in central Ohio during 1972 and 1973. Two of the drainages were cropped to corn and received nominal amounts of chemical fertilizer. The third drainage was in continuous alfalfa and previously received applications of dairy manure. Average nitrogen losses were 37, 19, and 0.6 pounds per acre per year. Nitrogen concentrations tended to decrease with time during each growing season. Tile effluent from the alfalfa site had consistently lower nitrogen concentrations. Most of the nitrogen loss was in the nitrate form. Sediment losses averaged 335, 47, and 148 pounds per acre per year. Because of large acreages of poorly drained agricultural land in western and northwestern Ohio and adjoining states, the contribution of nutrient and sediment losses in tile drainage to total losses may be significant. (Singh - ISWS)
W76-08121

THE BALTIC SEA--A SEMI-ENCLOSED SEA, AS SEEN BY THE HYDROLOGIST,
Swedish Natural Science Research Council, Stockholm.
For primary bibliographic entry see Field 2L.
W76-08130

LAND USE AND WATER QUALITY IN NEW YORK RIVERS,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Agricultural Engineering.
D. A. Haith.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE1, Proceedings Paper 11902, p 1-15, February 1976. 7 tab, 27 ref, 2 append.

Descriptors: *Land use, *Water quality, *Water pollution, *Drainage practices, *New York, Surface drainage, Statistical methods, Estimating, Mathematical studies, Water chemistry, Water control, Nitrogen compounds, Water properties, Phosphorus compounds, Nutrients, Rivers, Waste disposal, Water management(Appliedd, Suspended soilds, Agricultural runoff.
Identifiers: Land-use, *Nonpoint pollution sources, Water quality management, Water quality planning.

The Federal Water Pollution Control Act Amendments of 1972 require that land-use management and control of nonpoint pollution sources be included in areawide water quality planning. At the present time, few tested procedures are available to implement this policy. Statistical techniques, including correlation and regression analyses, offer a promising methodology for the study of land use and nonpoint source impacts on water quality. The methodology has been applied to water quality and land-use data from 20 river basins in New York State. The results indicated that river basin land uses could account for up to 89% of the observed variation in mean river nitrogen concentrations and 63% of the observed variation in mean total suspended solids concentrations. No relationships between phosphorus concentrations and land uses were found in the basins. (Henley-ISWS)
W76-08133

SHOOTING MODELS FOR SALINITY AND COLIFORM,
Texas Univ. at Austin. Dept. of Electrical Engineering.
B. J. Olufeagba, and R. H. Flake.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE1, Proceedings Paper 11939, p 95-109, February 1976. 9 fig, 2 tab, 14 ref, 2 append.

Descriptors: *Mathematical models, *Salinity, *Coliforms, *Estuaries, *Water quality, Mixing, Computer models, Model studies, Bays, Water pollution, Circulation, Currents(Water), Dispersion, Advection, Convection, Waste dilution, *New York.
Identifiers: Shooting models, *Jamaica Bay(NY), Boundary value problems.

A method for solving the water quality models by a shooting technique was presented for Jamaica Bay. The technique exhibited excellent convergence rates for linear problems and generally involved the solution of much smaller linear systems than models utilizing direct finite difference methods. The method, which has been extended to multiconstituent water quality problems, has also been employed in the determination of water quality management policies in Jamaica Bay. A recent study has shown that these shooting techniques may also be employed in solving boundary value problems in which the elliptic operator is approximated with sparse two-dimensional finite difference equations with a considerable reduction in the size of the linear systems to be solved. (Bender-ISWS)
W76-08134

TWO-DIMENSIONAL MATHEMATICAL WATER QUALITY MODEL,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
B. J. Williams, and J. B. Hinwood.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE1, Proceedings Paper 11947, p 149-163, February 1976. 5 fig, 1 tab, 24 ref, 2 append.

Descriptors: *Computer models, *Water quality, *Australia, *Mathematical models, Biochemical oxygen demand, Dissolved oxygen, Organic matter, Water pollution, Model studies, Computers, Coliforms, Nitrates, Nutrients, Pollutants, Water chemistry, Water analysis, Hydrodynamics, Dispersion, Topography, Suspended solids, On-site data collections, Forecasting, Tides, Velocity.
Identifiers: *Water quality model, *Westernport Bay(Australia), Computational techniques, Pollutant transport model, Organic carbon.

A large-scale computer model of water quality in Westernport Bay, Australia, was described. Comparison was made between model predictions and field measurements. The model consisted of four submodels, i.e., the Topographic Model, Hydrodynamic Model, Pollutant Transport Model, and the Chemical Kinetics and Interaction Model. The following physical variables were provided as output at gridpoints throughout the bay-interpolated depths, tide heights, and velocity components. The movement of nonreacting tracer particles was computed. Concentrations of the following chemicals and other materials, averaged over depth, were determined: (1) dissolved oxygen deficit, (2) organic carbon, (3) BOD, (4) nitrogen as organic matter, (5) nitrate and ammonia, (6) coliforms, (7) conservative pollutants, and (8) suspended solids. Bulk water temperature was computed also. Computational techniques and experiences with the model were described and proposais for future development were examined. (Henley-ISWS)
W76-08135

NITROGEN AND PHOSPHORUS LOSSES FROM WINTER DISPOSAL OF DAIRY MANURE,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W76-08159

DISTRIBUTION OF PLUTONIUM IN SOIL PARTICLE SIZE FRACTIONS OF LIQUID EFFLUENT-RECEIVING AREAS AT LOS ALAMOS,
Los Alamos Science Lab., N. Mex.
J. W. Nyhan, F. R. Miera, and R. J. Peters.
Journal of Environmental Quality, Vol. 5, No. 1, p 50-56, 1976. 5 fig, 4 tab, 16 ref. ERDA W-7405-Eng. 36.

Descriptors: *Radioactive waste disposal, *Soils, *Particle size, *Effluents, *Distribution patterns, *New Mexico, Alluvium, Depth, Soil texture, Outlets, Intermittent streams, Cation exchange, Path of pollutants.
Identifiers: *Plutonium, Los Alamos(NM).

Alluvial soils of three effluent-receiving canyons at Los Alamos, New Mexico, were sampled to determine plutonium-238 and plutonium-239,240 distributions in soil size fractions as a function of soil depth, distance from waste outfall, and soil physical-chemical properties. Plutonium concentrations in less than 53 micrometer soil fractions were ten-times higher than in 2-23 mm fractions, but plutonium concentration was greatest in fractions larger than 105 micrometers; concentrations decreased curvilinearly with distance from outfalls and with soil depth. Smaller fractions had seven-times more surface area and three-fold more cation exchange capacity than larger fractions; plutonium concentrations in the size fractions correlated with surface area. Most Mortandad Canyon soils samples showed an approximate doubling of the Pu ratio with increased soil depth and within 40 meters of the outfall. Smaller fractions had a two-fold higher average ratio than larger fractions. Plutonium distribution in soil size fractions is discussed as a function of changing isotopic composition of liquid wastes added to the canyons, movement of soil and Pu in these intermittent streams, and potential isotopic differences in Pu behavior. (Buchanan-Davidson--Wisconsin)
W76-08160

POLLUTION OF SURFACE IRRIGATION WATERS BY PLANT PATHOGENIC ORGANISMS,
Nebraska Univ., Lincoln.
J. R. Steadman, C. R. Maier, H. F. Schwartz, and E. D. Kerr.
Water Resources Bulletin, Vol. 11, No. 4, p 796-804, August 1975. 3 fig, 3 tab, 20 ref. OWRT B-021-NEB(2)

Descriptors: Water resources, *Irrigation, *Water pollution, *Bacteria, *Surface waters, Fungi, Nematodes, Epidemiology, Sampling, Agriculture, *Nebraska.
Identifiers: *Phytopathogenic bacteria, Phytopathogenic fungi, Phytopathogen dissemination, *North Platte Project(Neb).

Systematic sampling of waterways and irrigation runoff from agricultural lands in the North Platte Project of Nebraska in July and August of 1972-1974 demonstrated that phytopathogenic organisms were disseminated. The organisms monitored included the bean common blight bacterium Xanthomonas phaseoli, the bean white mold fungus Whetzelinia sclerotiorum and various nematodes. Although many types of nematodes often were recovered from irrigation water, Heterodera sp. cysts which cause significant disease problems in the valley were found infrequently. Patterns of movement of the bacterial and fungal organisms were correlated with previous or current season infection of bean plants. The short-term survival of X. phaseoli in sterile deionized water may explain the detection of this organism only in runoff or ditches receiving runoff from common blight infected bean fields. Sclerotial bodies of W. sclerotiorum remained viable for at least 10-21 days in flowing water and were found throughout the irrigation waterways. Irrigation of beans with contaminated water can result in both common blight and white mold diseases. Dissemination of phytopathogenic organisms in irrigation reuse systems as well as agricultural land runoff should be considered in irrigation planning and system design. (Bell-Cornell)
W76-08230

SESSILE ANIMALS ON TAR GLOBULES IN THE WATERS AROUND THE RYUKYU ISLANDS, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 2L.
W76-08232

DISTRIBUTION OF CHAETOGNATHA AND BIOMASS OF THE ZOOPLANKTON IN THE WESTERN PART OF THE TROPICAL ATLANTIC, DURING JULY AND AUGUST 1968, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08245

TOWN HALTS INFILTRATION.
For primary bibliographic entry see Field 5D.
W76-08257

INFLUENCE OF THE LOCAL PRECIPITATION QUANTITY ON THE LOADING OF WATER BODIES WITH MIXED WATER (DER EINFLUSS DER OERTLICHEN NEIDERSCHLAGSHOEHE AUF DIE BELASTUNG DER GEWAESSER MIT MISCHWASSER),
P. G. Brunner.
Berichte der Abwassertechnischen Vereinigung, No. 26, p 163-172, 1973. 8 fig, 5 ref.

Descriptors: *Hydrological aspects, *Precipitation intensity, Bodies of water, Sewers, *Storm runoff, Pollutants, Overflow, Precipitation(Atmospheric), Storm water, Europe, Cities.
Identifiers: Dry-weather runoff, Germany.

The influence of local precipitation quantity on the loading of mixed water bodies was studied partly on the basis of systematic pluviographic measurements conducted in the German cities of Ingoldstadt, Munich, and Mittenwald. Increases in the quantity, duration, and frequency of the loading (composed of surface storm runoff, deposits in sewers, and dry-weather runoff) with increasing precipitation quantity were observed. Results indicate a rapid increase in the rate of pollutant deposition with increasing deposition time. Also, for high critical precipitation quantities over 10 liters per second, climatic factors had little effect on overflows caused by storm water over extended periods of time. (Takacs-FIRL)
W76-08258

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III - VOLUME 1--DRY WEATHER FLOWS,
Texas Tech Univ., Lubbock. Water Resources Center.
M. Gibson, R. H. Ramsey, B. J. Claborn, R. M. Sweazy, and D. M. Wells.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 425, $5.00 in paper copy, $2.25 in microfiche. Final Report WRC-75-2, December 1975. 71 p, 3 fig, 25 tab, 29 ref, append. OWRT B-177-TEX(2).

Descriptors: Dry seasons, *Model studies, *Texas, Storms, *Urban runoff, *Water pollution sources, *Water quality, Cities, Biochemical oxygen demand, Chemical oxygen demand, Sampling, Watershed management, *Storm runoff, Suspended solids, Nitrates, Phosphates, Urbanization.
Identifiers: *Dry weather flows, *Lubbock(Tex), Semi-arid areas, Total solids, Flow volumes, Urban watersheds.

Water samples and flows were obtained from storm events and dry weather flows occurring on a 1,499 acre urban watershed in Lubbock, Texas over a nine month period from September 1974 through May 1975. The watershed was monitored daily by an automatic sampler, automatic flow recorder, and raingages. Hourly flow samples from 59 precipitation events and 199 dry weather flows were combined into daily composites which were analyzed for COD, BOD, Total Solids, Total Suspended Solids, Orthophosphate and Nitrate. Four predictive flow models were selected to generate data to be compared to actual observed flow data. Criteria for selecting the models used in the analyses were the time, money, and effort required for implementation. The predictive flow models utilized were the rational method; the Viessman and Miller method; the Viessman, Keating, and Srinivasa Method, and the British Road Research method. Using three storms of varying characteristics, the total runoff volume and peak flows from the predictive models were compared to the observed total runoff and peak flows in each case. The results from this small sample were inconclusive. (See also W76-08279 thru W76-08281)
W76-08278

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 2, IMPACTS OF DUST STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08279

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 3 - ANALYSIS OF FLOW MODELS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08280

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 4 - PROJECT SUMMARY,
Texas Tech Univ., Lubbock. Water Resources Center.
D. M. Wells, R. M. Sweazy, B. J. Claborn, and R. H. Ramsey.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 428, $4.50 in paper copy, $2.25 in microfiche. Final Report WRC-75-4, December 1975. 47 p, 14 fig, 15 tab, 7 ref.OWRT B-177-TEX(6).

Descriptors: *Urban runoff, *Urban hydrology, *Water quality, *Water pollution sources, *Texas, *Model studies, Watershed management, Cities, Urbanization.
Identifiers: Lubbock(Tex), Semi-arid areas, Model analysis.

This report summarizes the urban runoff studies that were conducted in Lubbock, Texas for the period from July 1, 1969 through the date of this report under the sponsorship of the Office of Water Research and Technology, Texas Tech University, and the City of Lubbock. The three phases of the study during this period are reviewed and the major findings discussed. General conclusions drawn from those studies conducted in this semi-arid area were: that the quality of urban runoff is extremely variable and highly unpredictable; that runoff quality improves with duration of runoff; that the first-flush phenomenon that occurs in urban runoff has some validity but has limited practical value in alleviating water quality

problems associated with urban runoff. On large watersheds the first-flush from the uppermost areas coincides with cleaner flows from the lower sub-areas and results in a more uniform concentration of pollutants through a longer time span; and that the water quality impact of runoff from residential areas does not appear to be as great as much of the runoff quality data would indicate it to be, since no fish kills have been observed in the playa lakes into which this runoff flows. (See also W76-08278)
W76-08281

DENSE EFFLUENT DISPERSION IN A STREAM,
Oregon State Univ., Corvallis. School of Oceanography.
H. Crew, and R. O. Reid.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol. 102, No. EM1, Proceedings Paper 11915, p 77-88, February 1976. 7 fig, 4 ref, 2 append. (Subcontract from Dow Chemical Company). OWRT 14-01-0001-2169.

Descriptors: *Effluents, *Dispersion, Hydrodynamics, Waste disposal, *Numerical analysis, Analytical techniques, Water pollution, Diffusion, Buoyancy, Flow, Advection, Density, Equations, Model studies, *Path of pollutants.
Identifiers: *Density plume, Navier-Stokes equations.

A plume of effluent issuing from a port bends away from the vertical due to advection by the stream current, while its cross-sectional area increases due to turbulent diffusion. The axis of the plume becomes horizontal some distance downstream from the port, and farther downstream the plume axis tilts downwards and constitutes the far field region. Convective circulation and buoyancy effects govern the motion in this region. The Navier-Stokes equations and advective-diffusion equation for density were solved numerically for the fields of flow and density downstream of the discharge port. The numerical results appeared to be satisfactory solutions of the governing equations and boundary conditions for a broad range of effluent densities. While the model did not attempt to simulate dispersal in a natural stream, it did so to the extent that the stream meets the conditions imposed by the assumptions made in formulating the equations and boundary conditions. (Singh-ISWS)
W76-08316

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. VII, A HINDCAST,
New York City-Rand Inst., N.Y.
J. J. Leendertse, and S-K. Liu.
Report R-1774-NYC, July 1975. 99 p, 13 fig, 10 ref, 8 append.

Descriptors: *Water quality, *Urban runoff, *Estuarine environment, *Model studies, *New York, Computer models, Mathematical models, Coliforms, Pollutants, Path of pollutants, Sewage bacteria, Bays, Estuaries, Tides, Storm runoff, On-site data collections, Sampling, Simulation analysis.
Identifiers: *Jamaica Bay(NY), *New York City(NY).

This report described a hindcast of post-rainstorm coliform bacteria distributions in Jamaica Bay made by use of a water-quality simulation model of that bay and models of the surrounding drainage basins on the basis of tide, wind, and rainfall data. That hindcast was then compared with coliform estimates obtained by field sampling. Although the investigators did not have access to the results of the field sampling until the hindcast was completed, the estimates obtained by simulation agreed well with the estimates from field data. It was concluded that the models used were capable of making predictions for engineering assessments. (See W75-07042; W73-07935; W72-06980; W72-06979; and W71-04038) (Sims-ISWS)
W76-08317

UPDATING THE NAVY ENVIRONMENTAL PROTECTION DATA BASE TO INCORPORATE OIL SPILL CLEAN-UP PERFORMANCE,
Naval Postgraduate School, Monterey, Calif.
J. Antonelli.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A012 663, $4.25 in paper copy, $2.25 in microfiche. Master's thesis, june 1975. 70 p, 11 fig, 9 ref, 5 append.

Descriptors: *Oil spills, *Oil pollution, *Water pollution, *Information retrieval, Computers, Data transmission, Ships, Water pollution sources, Water pollution control, Military aspects, Harbors, Estuaries.
Identifiers: *Reporting systems, *Data bases, Computer data bases, Oil-spill clean-up.

In this thesis, proposals were formulated on methods of reporting, collecting, and disseminating information on the surrounding conditions of an oil spill to and from the Navy Environmental Protection Data Base. The reporting aspect consists of a contingency plan and two reports, an initial report and an after action report. Such a reporting method is possible because of a proposed retrieval system. The data collection method emphasizes information that will produce an accurate cost figure. The dissemination process consists of new report formats to be included in the quarterly summary reports. (Sims-ISWS)
W76-08320

CORALVILLE WATER QUALITY STUDY, ANNUAL REPORT, WATER YEAR OCTOBER 1, 1974 TO SEPTEMBER 30, 1975,
Iowa University, Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5A.
W76-08324

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY, PART II: NON-CONSERVATIVE SPECIES TRANSPORT MODELS,
Alabama Univ., Dept. of Chemical and Metallurgical Engineering.
H-A. Liu, and G. C. April.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-17772, $7.75 in paper copy, $2.25 in microfiche. BER Report No. 185-112, Master's thesis, January 1975. 188 p, 40 fig, 15 tab, 32 ref, 2 append. NASA NAS8-29100.

Descriptors: *Model studies, *Rivers, *Bays, *Water quality, *Alabama, Mathematical models, Computer models, Computer programs, Coliforms, Temperature, Water transfer, Flow rates, Streamflow, Path of pollutants, Water pollution, Estuaries.
Identifiers: *Mobile Bay(Ala).

The purpose of this research effort was to expand the mathematical modeling capabilities of the hydrodynamic and salinity models of Hill and April to include a description of non-conservative species transport in the Mobile Bay system. The knowledge gained provided a clear insight into the effect that rivers draining into the bay have on water quality conditions. Total coliform group bacteria were selected because of their relationship to commercial fishing ventures within bay waters and also on the basis of data availability sufficient for model calibration and verification. Results were presented as monthly average distributions corresponding to the data base used. A parametric study was also conducted. In this study, river flow rates, wind conditions, and bay system temperatures were investigated to determine their influence on the total coliform concentration patterns. Of these factors, temperature and river flow rate had a pronounced effect on the concentration profiles, while wind conditions showed only slight effects. Shifts in concentration profiles as much as 8 km were observed in extreme cases. The effect of changing total coliform group loading concentrations at constant river flow rates and temperature was also investigated. As expected, these loading changes had an appreciable influence on total coliform distribution within Mobile Bay. (Sims-ISWS)
W76-08327

POLLUTANT TRANSPORT IN NATURAL STREAMS,
Du Pont de Nemours (E. I.). and Co., Aiken, S.C. Savannah River Lab.
M. R. Buckner, and D. W. Hayes.
Report DP-MS-74-53, 1975. 15 p, 5 fig, 10 ref. ERDA AT(07-2)-1.

Descriptors: *Model studies, *Path of pollutants, *Streams, Radioisotopes, Chemicals, Tritium, Mathematical models, Rivers, Tributaries, Dispersion, Industrial wastes, Pollutants, Water pollution, Sampling, Tracers, Dye releases, Sediments, Deposition(Sediments), Ion exchange, *Georgia.
Identifiers: *Savannah River(Ga).

A mathematical model has been developed to estimate the downstream effect of pollutant releases to tributary streams and rivers. The one-dimensional dispersion model was employed along with a dead zone model to describe stream transport behavior. Options were provided for sorption/desorption, ion exchange, and particle deposition in the river. The model equations were solved numerically by the LODIPS computer code. The solution method was verified by application to actual and simulated releases of radionuclides and other chemical pollutants. (Sims-ISWS)
W76-08329

SOLUTION FOR RADIAL-FLOW WITH NON-LINEAR ADSORPTION,
Amoco Production Co., Tulsa, Okla.
S. P. Gupta, and R. A. Greenkorn.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102 No. EE1, Proceedings Paper 11901, p 87-94, February 1976. 2 fig, 14 ref, 2 append.

Descriptors: *Groundwater movement, *Path of pollutants, *Adsorption, *Dispersion, *Porous media, *Soil contamination, *Computer models, Flow, Groundwater, Base flow, Movement, Water pollution, Water pollution sources, Waste disposal, Environmental engineering, Diffusion, Convection, Hydrology, Numerical analysis.
Identifiers: *Radial flow, Nonlinear adsorption, Point-source radial flow, Crank-Nicolson method, Freundlich isotherm, Finite difference approximation.

A nonlinear convective diffusion equation was obtained for a radial flow with Freundlich equilibrium adsorption. Numerical solution by explicit or implicit finite difference approximation requires large computation time and suffers from the error due to 'numerical dispersion.' The equation was solved by an efficient and higher order finite difference approximations, i.e., the Crank-Nicolson method. The numerical solution is useful for studying the spatial and temporal movement of the chemicals from contaminated water. (Bender - ISWS)
W76-08345

DETERMINATION OF BIOLOGICAL DEGRADABILITY OF ORGANIC SUBSTANCES,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
P. Pitter.

Water Research, Vol. 10, No. 3, p. 23-235, 1976. 1 fig., 3 tab., 11 ref.

Descriptors: *Biodegradation, *Organic compounds, Chemical oxygen demand, Carbon, Activated sludge, Microbial degradation, Aromatic compounds.
Identifiers: Aliphatic compounds, Hydroaromatic compounds.

Experiments on the degree and rate of biological degradation of 123 organic compounds with respect to decrease of the organic substance in terms of chemical oxygen demand were conducted. The organic substances were the sole source of carbon for microbes in the inoculum which was adapted activated sludge from a sewage plant. The degradation rate was expressed in terms of mg of chemical oxygen demand removed by a gram of the initial dry matter in the inoculum per hour. Degradation rates were determined for 94 aromatic, 15 hydroaromatic, and 14 aliphatic compounds. Pyrogallol, metol, 3,4-dimethylaniline, N-phenylanthranilic acid, 2-chloro-4-nitrophenol, 2,4,6-trinitrophenol, 3,5-dinitrobenzoic acid, 3,5-dinitrosalicylic acid, nitroanilines, 0-phenylenediamine, m-phenylenediamine, aminophenolsulphonic acid, 1-naphthylamine, 1-naphthylamine-6sulphonic acid, m-benzenedisulphonic acid, 2,5-dinitrophenol, 2,6-dinitrophenol, 1,3-dinitrobenzene, and 1,4-dinitrobenzene were resistant to biological decomposition. Factors affecting biological degradability are identified as: physicochemical factors (temperature, solubility, degree of dispersion of compound in media, pH, dissolved oxygen), biological factors (history of microbial culture; its age, manner, and time of adaptation; compound toxicity; effect of other substrates), and chemical factors (molecular size; length of chain; kind, number, and position of substituents in the molecule stereochemistry). (Buchanan-Davidson--Wisconsin).
W76-08351

A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS,
Agricultural Research Service, Watkinsonville, Ga.
R. R. Bruce, L. A. Harper, R. A. Leonard, W. M. Snyder, and A. W. Thomas.
Journal of Environmental Quality, Vol. 4, No. 4, p. 541-548, 1975. 8 fig., 1 tab., 18 ref.

Descriptors: *Mathematical models, *Agricultural runoff, *Pesticides, *Watersheds(Basins), *Georgia, Translocation, Erosion, Storms, Rainfall-runoff relationships, Rainfall intensity, Rill erosion, Model studies, *Path of pollutants.
Identifiers: Watkinsville(Ga).

A mathematical model describing runoff rates and quantities from separate rainfalls on a watershed and the rates and quantities of sediments and pesticides transported was developed. Runoff water was calculated and rill and interrill erosion conceptually distinguished, permitting partitioning of associated pesticides. Sediment contributions from interrill erosion were a function of rainfall intensity and soil susceptibility to erosion. Rill erosion was a function of water runoff and rate of change of water runoff. Runoff pesticide concentrations were functions of runoff amounts, sediment from rill and interrill erosion, and pesticide concentrations in runoff-erosion zones. Excellent simulations were obtained when the model was used to simulate water, sediment, and pesticide runoff from an upland Piedmont plain watershed during summer storms. Pesticide runoff simulations were achieved using simple relationships between relatively immobile soil pesticide concentrations and eroded sediments. Other versions of this model are being considered to simulate mobile chemical runoffs which will include subsurface water transport. The chemical component will be revised to accommodate major chemical extractions from soil without soil movement and show subsurface flow characteristics. Updating of water and chemical conditions between storms is necessary but depends on the watershed cultural system and chemicals used. (Buchanan-Davidson--Wisconsin)
W76-08356

BEHAVIOUR OF OIL UNDER CANADIAN CLIMATIC CONDITIONS. PART 1. OIL ON WATER UNDER ICE-FORMING CONDITIONS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
B. F. Scott, and R. M. Chatteriee.
Scientific Series No. 50, 1975. 28 p, 15 fig, 8 tab, 16 ref.

Descriptors: *Weathering, *Oil spills, *Cold regions, *Freezing, *Canada, Aquatic life, Weather data, Analysis, Snow, Water pollution effects, Ice cover, Oil pollution.
Identifiers: Ottawa(Canada).

Experiments conducted at Shirley's Bay Quiet Site near Ottawa, to determine the effect of freezing temperatures on the behavior of oil, are described. For the first 24 hours after the spill, freeze-up conditions prevailed with wind speed and clear skies; the oil lost approximately 29% by weight of its components during the first day, including the volatile fractions, some of which had evaporated within an hour after the spill. Once the volatile fraction was removed, loss of the other oil components took longer and depended on the climate. A sample taken three days after above-freezing temperatures contained no actane; 40% by volume of the oil had evaporated--a loss of another 10%. During 4C temperatures and cloudy skies for the following three days, 46% by volume of the oil had evaporated, characterized by the loss of nonane. Decane was present in samples eight days after the spill, when about 50% of the oil remained. Accelerated wind speed and moderate air temperatures augmented evaporation while low temperatures retarded the evaporation rate. Very little surface oil was evident in the pond during spring clean-up but an oily slime was noted on the bottom of the pool. Oil inhibited small forms of aquatic life but increased the abundance of others. (Auen-Wisconsin)
W76-08365

THE KINETICS OF MICROBIAL NITRIFICATION,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-08369

MINE DRAINAGE POLLUTION WATERSHED SURVEY, CHERRY CREEK, CASSELMAN RIVER WATERSHEDS, GARRETT COUNTY, MARYLAND.
Skelly and Loy, Harrisburg, Pa.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 610 $11.00 in paper copy, $2.25 in microfiche. Prepared for the Appalachian Regional Commission, Washington, D.C., May 1973. Final Report. 417 p, 33 fig, 42 ref, 8 append. ARC No. 42-47/RP-228.

Descriptors: *Water pollution, Abatement, *Water pollution control, *Pollution abatement, *Water quality, *Acidic water, *Acid mine water, *Mine acids, *Coal mine wastes, Data collection, Aquatic animals, Environment, Regional analysis, Maryland, Pennsylvania, *Watershed management, Landfill.
Identifiers: Cherry Creek(MD), Casselman Creek(PA and MD).

This study area includes the 14 square mile Cherry Creek Watershed and a 70 sq mi portion of the Casselman River Watershed, in MD and PA. There has been coal mining in this area for over 100 years which benefited the local economy but caused water pollution. This study was carried out in 8 phases: collect and review data; reconaissance; control sampling in some streams; detailed field explorations; subsurface explorations; interpret aquatic biotic data; mine development drawing; and evaluate sources and abatement measures. Essential was the sampling program which measured discharge from mines and the effect of mine drainage on the receiving streams. Water quality, flow and weather data were collected 14 times during the year at 82 sampling stations. As background data, the quality of unpolluted streams was also measured. Of the four major streams studied, Cherry Creek is the most seriously polluted, but only 1/4 of this can be laid to acid load derived from mines. The rest is natural. The North Branch Casselman River is the second worst polluted and is moderately affected by mine drainage over many stream miles. The South Branch Casselman River and the Casselman River are slightly polluted from mine drainage. The water quality in these streams has been degraded sufficiently to suppress many kinds of acquatic life including normally occuring game fish. An abatement program is suggested. The estimated 2400 lbs/day of acid being discharged at the site of 38 recommended abatement projects could be curtailed at a cost of $1,359,000. Projects include recontouring of mine sites, plugging of mines, burial of solid waste, and use of sites as sanitary landfill. (Smith-North Carolina)
W76-08386

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
D. McLaughlin, J. A. Elder, G. T. Orlob, D. F. Kibler, and D. E. Evenson.
NOAA Report TM ERL MESA-4; December 1975. 373 p, 68 fig, 33 tab.

Descriptors: *Ecosystems, *Water pollution sources, *Pollutants, *Environmental Engineers, *Marine geology, *Marine biology, Water quality, Model study, Environmental control, New York.
Identifiers: Bight, New York Bight, *New York Bight ecosystems.

This technical memorandum offer a comprehensive, conceptual representation of the physical, geological, chemical and biological process that affect the New York Bight ecosystem, as well a some specific recommendations suggesting where field and laboratory research efforts should be undertaken to support a satisfactory evaluation of management alternatives in the New York Bight. The report identifies the important problems in the New York Bight, in order to develop effective strategies and research efforts towards solving them. They are; the movement of undesirable materials onto beaches, shellfish contamination, and a decline and instability in migratory fisheries. The problem is described, the critical subsystems are identified, they are reviewed in the light of present knowledge, and a set of recommendation (or research tasks) for future implementation is proposed. (NOAA)
W76-08411

CHLORINATED HYDROCARBONS IN MESOPELAGIC FISHES OF THE EASTERN GULF OF MEXICO,
University of South Florida, St. Petersburg, Fla.
For primary bibliographic entry see Field 5C.
W76-08434

DDT AND ITS METABOLITES IN THE SEDIMENTS OFF SOUTHERN CALIFORNIA,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08436

NOTE ON THE DISTRIBUTION OF MERCURY IN FISH SPECIES IN THREE OHIO LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5C.
W76-08441

PASSAGE OF METALS IN EFFLUENTS, THROUGH BACTERIA TO HIGHER ORGANISMS,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
F. M. Patrick, and M. Loutit.
Water Research, Vol. 10, p 333-335, 1976. 1 fig, 3 tab, 7 ref.

Descriptors: *Heavy metals, Benthos, *Absorption, *Tubificids, *Path of pollutants, *Primary productivity, *Aquatic bacteria, Chromium, Copper, Manganese, Lead, Iron, Zinc, *Food chains, *Food webs, Bacteria, Aquatic animals, Benthic fauna, Analytical techniques, Laboratory tests, Bioassay, Effluents, Water pollution effects.
Identifiers: *Bioaccumulation.

Bacteria from river bottom sediments were cultured in the laboratory on culture plates containing six metals in the medium. Bacteria were found to concentrate the metals and tubificids fed bacterial cultures containing these metals showed increased amounts of the metals. It is thought that small amounts of metals in effluents are concentrated by bacteria and are then passed to other organisms in a food chain. (Katz)
W76-08449

STAFFLINERS PREVENT CONTAMINANTS FROM POLLUTING GROUND WATER AT INDUSTRIAL WASTE TREATMENT CENTER.
For primary bibliographic entry see Field 5D.
W76-08466

THERMAL-HYDRAULIC MODEL STUDY OF OFFSHORE DISCHARGE SYSTEM FOR KAHE POWER PLANT, HAWAII,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
S. C. Jain, M. Leonard, and J. F. Kennedy.
IIHR Report No. 184, January 1976. 33 p, 18 fig, 1 tab, 6 ref.

Descriptors: *Model studies, *Hydraulic models, *Heated water, *Hawaii, Powerplants, Outlet works, Outlets, *Thermal pollution, Path of pollutants, Oceans, Coasts, Water cooling, Temperature, Water temperature, Heat, Dispersion, Ocean currents, Currents(Water).
Identifiers: Kona currents.

The investigation was concerned with the design of the outfall structure for the condenser cooling-water discharge from Kahe Power Plant. The recommended discharge structure consists of two 12-ft diameter pipes, each terminating into an 11-ft diameter nozzle discharging offshore at an angle of 20 degrees above horizontal. The nozzles will be located at a water depth of 27 ft below MLLW. The model tests indicated that the recommended outfall configuration will satisfy both average and instantaneous criteria on temperature rise for longshore currents and for small Kona currents. Only under some larger Kona currents does the maximum instantaneous temperature at the bottom exceed 3 degrees F and the maximum average temperature near the shoreline close to the baffles (installed to produce Kona currents) exceed 1.5 degrees F and then only by small amounts. (Sims-ISWS)
W76-08508

RADIAL DISPERSION THROUGH ADSORBING POROUS MEDIA,
Sargent and Lundy, Chicago, Ill.
A. Prakash.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11995, p 379-396, March 1976. 7 fig, 2 tab, 23 ref, 2 append.

Descriptors: *Adsorption, *Dispersion, *Porous media, *Mathematical models, Finite element analysis, Hydraulics, *Tracers, Ion transport, Convection, Diffusion, Equilibrium, Groundwater, Velocity, Equations, Wells, Water pollution, *Path of pollutants.
Identifiers: *Radioactive decay, *Transport mechanisms, Galerkin technique, Miscible displacement, Tortuosity, Nonequilibrium conditions, Partial penetration.

The convective-dispersion equation for the transport of a radioactive tracer through an adsorbing porous medium was solved in the cylindrical polar system of coordinates by the Galerkin finite element method. The effect of radioactive decay and equilibrium or nonequilibrium adsorption isotherms on the radial movement of pollutants containing different radioactive isotopes was illustrated. The solution technique was extended to special cases of anisotropic porous media. It was concluded that radioactive decay is an important mechanism for the transport of relatively short-lived radionuclides. The contribution of adsorption in retarding the propagation of concentration depends on the clay content of the porous medium and the chemical properties of the ions being transported. (Visocky-ISWS)
W76-08512

THE ROLE OF ORGANIC DETRITUS IN THE FORMATION OF DISTINCTIVE SANDY TIDAL FLAT SEDIMENTARY STRUCTURES, TAY ESTUARY, SCOTLAND,
Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center.
For primary bibliographic entry see Field 2L.
W76-08524

MERCURY IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
R. L. Thomas, and J-M. Jaquet.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 404-412, March 1976. 6 fig, 3 tab, 31 ref.

Descriptors: *Lake sediments, *Mercury, *Sediments, *Lake Erie, *Distribution patterns, Water pollution, *Great Lakes, Analytical techniques, Toxicity, Water pollution sources, Surface waters, Sedimentation, Inorganic compounds, Sediment distribution, Chemicals, Public health, Industrial wastes, Pollutant identification, On-site investigations, Sampling, Path of pollutants, Suspended load, Carbon, Bacteria, Benthos, Bottom sediments.
Identifiers: Surficial sediments, Detroit River, *Methylmercury, Organic carbon, Mercury poisoning, Chlor-alkali plants.

In 259 samples of the topmost 3 cm of sediment taken from Lake Erie in 1971, total mercury values ranged from 8 to 2929 ppb (with a mean of 582 + or - 555 ppb sd). The highest levels were in the Western basin adjacent to the Detroit River, the rest of the lake showing increasing concentration from the coarser sediments of the Inshore Zone and cross-lake moraine sills out into the basin muds. A quartz correction was applied to compensate for texture and dilution by an inert constituent. The distribution of quartz-corrected mercury confirmed that the Detroit River is the predominant source of industrial mercury to the Western basin with subsequent transport across the Central basin to final sink in the Eastern basin. Further possible inputs were indicated from Erie, Pennsylvania, and Buffalo, New York. Analysis of suspended sediment in the Detroit River showed no change in concentration between 1970 and 1974 with a mean 1974 level of 1060 ppb. Mercury loading was estimated at 7.2 m.t./yr to the sediments of the Western basin. A relationship was observed between total mercury and organic carbon, showing two distinct regressions: 'A' with lower organic-bound mercury, is taken to represent the levels related to industrial and natural loadings existing prior to the introduction of mercury cell chlor-alkali plants; 'B' applicable to highly contaminated sediments, is believed to be indicative of loadings derived from the chlor-alkali industry. (Henley - ISWS)
W76-08526

FORMS OF PHOSPHORUS IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
J. D. H. Williams, J-M. Jaquet, and R. L. Thomas.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 413-429, March 1976. 8 fig, 4 tab, 36 ref.

Descriptors: *Lake sediments, *Phosphorus, *Lake Erie, *Phosphates, *Phosphorus compounds, *Distribution patterns, *Great Lakes, *Sediments, Inorganic compounds, Analytical techniques, Chemicals, Water pollution sources, Surface waters, Sediment transport, Geology, Sedimentation, Sediment sorting, Chemical properties, Lake basins, Detritus.
Identifiers: Organic phosphorus, Inorganic phosphorus, *Surficial sediments, Apatite, Vivianite, Organic carbon, Detrital origin, Phyllosilicate minerals.

The phosphorus in 48 surficial Lake Erie sediment samples was present in three major forms: phosphorus associated with apatite, nonapatite inorganic phosphorus (NAIP), and organic phosphorus. The apatite was of natural, detrital origin. It existed as particles ranging from fine sand to clay in size but mostly as siltsized particles and was concentrated in nearshore sediments. Both NAIP and organic phosphorus was concentrated in fine-grained sediments accumulating in offshore depositional areas. NAIP was associated with amorphous hydrated ferric oxide in the oxidized microzone but was present as vivianite (Fe3(P04)2.8H20) and possibly other forms also in the reduced zone. The organic phosphorus content of the sediment was closely related to organic carbon content. The phyllosilicate, organic matter, and reactive iron and manganese components of the sediments existed in intimate association. (Henley-ISWS)
W76-08527

FORMS OF IRON AND MANGANESE IN LAKE ERIE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns, and J. O. Nriagu.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 463-470, March 1976. 5 fig, 1 tab, 22 ref.

Descriptors: *Iron, *Manganese, *Lake Erie, *Water chemistry, *Great Lakes, *Iron compounds, Analytical techniques, Iron oxides, Inorganic compounds, Surface waters, *Lake sediments, Mud-water interfaces, Silts, Water quality, Chemical analysis, Bottom sediments.
Identifiers: *Sediment resuspension, Sediment-water interface, Aquatic ecosystems, Particulate iron, Resuspended clays, Anoxic conditions, Soluble manganese, Manganese oxides.

About 95% of the iron observed in the lake water is bound to inorganic particles and is present in the water because of sediment resuspension. Contrary to popular belief, the upwelling of interstitial waters charged with ferrous iron does not appear to play an important part in the regeneration of iron from Lake Erie sediments except when anoxic conditions exist at the sediment-water interface.

By contrast, manganese is usually found in the overlying water as a result of the release of interstitial water containing dissolved manganese. This precipitates in oxygenated water so that most of the manganese present in the water is found in the particulate form. However, the released manganese will remain soluble if the oxygen saturation is less than 50%. In general, it was found that both the iron and manganese were in the particulate or soluble form in accordance with the geochemical solubility rules. (Henley - ISWS)
W76-08528

SEDIMENT YIELDS AND NUTRIENT LOADINGS FROM CANADIAN WATERSHEDS TRIBUTARY TO LAKE ERIE: AN OVERVIEW,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
E. D. Ongley.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 471-484, March 1976. 7 fig, 4 tab, 23 ref.

Descriptors: *Sediments, *Lake Erie, *Canada, *Rivers, Sampling, Monitoring, Suspended solids, Phosphorus, Nitrogen, Chlorides, Runoff, Watersheds(Basins), Discharge(Water), Nutrients, Pollutants, Water quality, Sediment discharge, Sediment transport, *Lake sediments, Sedimentation.

Mean annual loadings and unit yields for sediment, phosphorus, nitrogen, and chloride have been calculated for 19 river-mouth locations on the Canadian side of Lake Erie for the period 1967-72. Data, drawn from routine monitoring data files of Federal and Provincial agencies, were discussed in terms of biases inherent in such monitoring programs. Unit yields are only marginally related to basin substrate texture but show pronounced storage characteristics within basins for sediment and sediment-bound nutrients. It was suggested that there is a minimum threshold size of basin below which nutrient runoff is relatively unaffected by basin storage and uptake. (Sims - ISWS)
W76-08529

NUMERICAL COMPUTATIONS OF ADVECTIVE AND DIFFUSIVE TRANSPORTS OF CHLORIDE IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
D. C. L. Lam, and T. J. Simons.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 537-549, March 1976. 7 fig, 18 ref.

Descriptors: *Chlorides, *Mathematical models, *Lake Erie, *Water circulation, *Model studies, Great Lakes, *Path of pollutants, Inorganic compounds, Lakes, Surface waters, Analytical techniques, Testing, Mathematics, Circulation, Advection, Diffusion, Dispersion, Movement, Numerical analysis, Hydrodynamics.
Identifiers: *Chloride transports, Transport mechanisms, Advective transport, Diffusive transport, Aquatic systems.

This paper concerns a numerical simulation of lakewide advective and diffusive transports of conservative pollutants or nutrients, such as chloride, in Lake Erie. The study was a continuation of a hydrodynamic modeling experiment to compute water circulations throughout the 1970 shipping season and made use of ship observations of chloride distributions at approximately 4-wk intervals during 1970, together with estimates of river loadings for the same periods. The model equations were based on the time-dependent, mass-conserving advection-diffusion equation. A vertically mixed, one-layer, two-dimensional model was employed for spring and fall, whereas a two-layer model was used to simulate the stratified lake in summer. The equations were solved by finite-difference formulations on a horizontal grid with a mesh size of 6.67 km. Using time steps of 6 h, predictions were made of the change of chloride concentrations between pairs of cruises and the results were compared with observation. While the advective currents were derived from the previous hydrodynamic study, diffusion coefficients were estimated by comparing model results for a range of coefficients. The resulting numerical values compared favorably with findings of diffusion experiments in actual lake environments. (Henley - ISWS)
W76-08530

COMPUTATIONS OF PHYSICAL TRANSPORT AND REGENERATION OF PHOSPHORUS IN LAKE ERIE, FALL 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
D. C. L. Lam, and J-M. Jaquet.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 550-563, March 1976. 7 fig, 5 tab, 32 ref.

Descriptors: *Lake Erie, *Phosphorus, *Model studies, Mathematical models, Computer models, Sediment transport, Phosphorus compounds, Waves(Water), Winds, Suspended solids, Sediments, *Path of pollutants, Nutrients, Pollutants, Sedimentation.
Identifiers: *Phosphorus regeneration.

A one-layer, two-dimensional computer model for the time-dependent, lake-wide advective and diffusive transports as well as physical regeneration of total phosphorus in Lake Erie has been developed. It has 60 x 16 square grid cells of 6.67-km mesh size and uses a time step of 12 h. The model has been verified and found to be in reasonably good agreement with the Canada Centre for Inland Waters (CCIW) monitor cruise data for October, November, and December, during which period there were high winds with high phosphorus concentrations being observed. Computed daily averaged currents from a hydrodynamic model developed at CCIW were used for the transport terms and actual data for the lake boundary conditions. The physical regeneration was attributed to wave motions induced by wind. A formula was proposed which expresses the regenerated amount of total phosphorus in terms of wave orbital velocity and sediment mean grain size. A discussion was presented on the choice of the settling rate and the regeneration coefficient which produce satisfactory model results. (Sims-ISWS)
W76-08531

RATE OF CHLORIDE AND WATER MOVEMENT IN SOUTHERN CALIFORNIA SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W76-08545

NITRATE REDUCTION AND ASSOCIATED MICROBIAL POPULATIONS IN A PONDED HANFORD SANDY LOAM,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5G.
W76-08546

TRANSFER OF BORON AND TRITIATED WATER THROUGH SANDSTONE,
New Mexico State Univ., University Park. Dept. of Agronomy.
P. J. Wierenga, M. T. van Genuchten, and F. W. Boyle.
Journal of Environmental Quality, Vol. 4, No. 1, p 83-87, January-March 1975. 4 fig, 1 tab, 25 ref.

Descriptors: *Sandstones, *Boron, *Dispersion, *Groundwater movement, *Water quality, Groundwater recharge, Groundwater basins, New Mexico.
Identifiers: Tritiated water.

The movement of tritiated water and boron were determined during unsaturated flow through undisturbed sandstone cores. From the displacement and slope of the breakthrough curves relative to 1 pore volume of effluent, adsorption coefficients and dispersion coefficients were calculated of 0.135 and 1.06 cm(2)/day for boron, and 0.04 and 3.45 cm(2)/day for tritiated water, respectively. The data were used to predict the downward movement of boron through a sandstone formation in the Four Corners area of New Mexico. With 20 cm annual rainfall and 10% of the precipitation contributing to recharge, it was calculated to take 1,628 years for the boron concentration at the ground-water table at 86 m to reach one-half the boron concentration at the soil surface. (Skogerboe-Colorado State)
W76-08547

DISTRIBUTION AND MOVEMENT OF ZINC AND OTHER HEAVY METALS IN SOUTH SAN FRANCISCO BAY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. L. Bradford.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-251 111/A's, $4.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 37-75, February 1976. 58 p, 7 fig, 11 tab, 36 ref.

Descriptors: *Water pollution sources, *Bays, *Heavy metals, *Bottom sediments, *Path of pollutants, Chemical analysis, Suspended solids, Water analysis, Sediments, Zinc, Iron, Manganese, Copper, Cobalt, Nickel, Lead, Cadmium, Sampling, Data collections, Analytical techniques, *California.
Identifiers: *San Francisco Bay(Calif).

From September to December 1972, zinc in aqueous solution was discharged into south San Francisco Bay, Calif., from eight wastewater treatment plants at a net rate of 77 kilograms per day. This newly added zinc moved from the aqueous phase to the bottom sediment at a rate of about 0.026 micrograms/sq centimetre/day. The concentrations of extractable Fe, Mn, and Zn in the suspended solids of bay water increased significantly with time but the total mass of zinc in the study area residing in the suspended solids remained constant. Bottom sediments were aanalyzed for Fe, Mn, Zn, Cu, Co, Ni, and Pb in the 2 mm-20 micron and less than 20 micron size fractions. Concentrations of all but Ni were higher in the smaller size fraction by factors of 2 to 5. A varimax factor analysis of these data indicated that the concentration of each metal in the sediment is controlled by a separate process. Most of the variance in the lead concentrations in both size fractions is apparently due to the same factor, suggesting a single major source of lead such as automobile emissions. In water samples after 5 days' settling, Zn and Cu were being sequestered by fast reacting chelators, a fraction of which would not pass a 0.22 millimicron filter. Zn and Cd were being sequestered by slow reacting chelators. The mean increase in concentration caused by destroying these latter chelators was 0.66 micrograms/litre of Zn and 0.023 micrograms/litre of Cd. (Woodard-USGS)
W76-08561

SAVANNAH RIVER LABORATORY ENVIRONMENTAL TRANSPORT AND EFFECTS RESEARCH ANNUAL REPORT - 1974.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
Available from the National Technical Information Service, Springfield, Va 22161, as DP-1374, $7.50 in paper copy, $2.25 in microfiche. June 1975. 206 p, 86 fig, 29 tab, 78 ref. Compiler, Crawford, T. V. ERDA AT (07-2)-1.

Descriptors: *Environmental effects, Pollutants, *Water pollution, Path of pollutants, Radioactivity, Thermal stress, Groundwater, Surface waters, Model Studies, *Thermal pollution.

A principal objective of environmental transport research at SRL was to develop, apply, adapt, use, test, and verify models that predict the directions and magnitude of ecosystem processes. A series of articles, within a wide variety of disciplines is presented, describing the transport and dispersion of pollutants through the atmosphere of the southeastern United States, transport and dispersion of pollutants in the surface and ground water systems near the SRP, movement of radioactivity in soil and plant systems, the effect of C 14 production by the nuclear industry, thermal stress on aquatic organisms, and the effects of earthquakes upon ground displacement velocity and acceleration in the southeastern United States. A total of 26 papers are presented; 3 of these are concerned with pollutants in water and 7 with thermal stress on aquatic organisms. (Chilton-ORNL)
W76-08596

TRANSURANIUM NUCLIDES IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-08597

PLUTONIUM IN THE AQUATIC ENVIRONMENT, ITS BEHAVIOUR, DISTRIBUTION AND SIGNIFICANCE,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5C.
W76-08599

THE PLUTONIUM CONTENT OF PACIFIC OCEAN WATERS,
Geochemistry Research Association, Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W76-08601

DISTRIBUTIONS OF TRANSURANIUM NUCLIDES IN SEDIMENT AND BIOTA OF THE NORTH ATLANTIC OCEAN,
Woods Hole Oceanographic Institution, Mass.
V. T. Bowen, H. D. Livingston, and J. C. Burke.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 107-120, 3 tab, 2 fig, 21 ref. E(11-1)-3563.00, E(11-1)-3563.01, E(11-1)-2379.

Descriptors: *Distribution patterns, *Radioisotopes, *Sediments, *Biota, Aquatic life, Plutonium, Americium, Atlantic Ocean, Benthos.

The report discusses the initial penetration of radionuclides into sediments, the redistribution of radionuclides within sediment columns and their release to the water column, and the availability of sediment transuranics to biota. In some types of sedimentation regimes transuranic radionuclides may be expected to remain immobile after deposition. In most types translocation of deposited plutonium and americium back toward the sediment surface takes place. The evidence also suggests some return of these radionuclides back to the water column. The activities of the benthic biota, and especially of the larger, burrowing worms aid in these transuranic remobilizations. (See also W76-08597) (Chilton-ORNL)
W76-08602

COMPARISON OF THE DISTRIBUTIONS IN MARINE SEDIMENTS OF THE FALLOUT DERIVED NUCLIDES FE 55 AND PU 239,240, A NEW APPROACH TO THE CHEMISTRY OF ENVIRONMENTAL RADIONUCLIDES,
Woods Hole Oceanographic Institution, Mass.
L. D. Labeyrie, H. D. Livingston, and V. T. Bowen.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 121-137, 3 fig, 4 tab, 31 ref.

Descriptors: *Distribution patterns, *Radioisotopes, Sediments, Marine geology, Geochemistry, Atlantic Ocean, Sea water.

Evaluation of the data suggests different hypotheses on the iron geochemical cycle and the consequences in trace element transport. In shallow water sediments, bacterial activity would solubilize available iron which would precipitate as microparticulates at the seawater-sediment interface carrying down with it trace elements. Dispersed microparticulates would translocate towards the open sea. Fe 55 exhibits a mean sinking rate of 350 m/a while the particle settling speed of plutonium is significantly smaller. The data is consistent with the hypothesis of two populations of particles of different sinking characteristics and the possibility of a good deal of overlap between the two populations. The authors conclude that Fe 55 and Pu 239, 240 should be considered as among the best tracers at present available for the study of the contamination problems on the continental shelf and open ocean particulate-seawater interactions. (See also W76-08597) (Chilton-ORNL)
W76-08603

INTERACTION OF PLUTONIUM WITH COMPLEXING SUBSTANCES IN SOILS AND NATURAL WATERS,
Oak Ridge National Lab., Tenn.
E. A. Bondietti, S. A. Reynolds, and M. H. Shanks.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 273-287, 1 fig, 5 tab, 23 ref.

Descriptors: *Environmental effects, *Plutonium, *Chemical reactions, Soils, Analytical techniques.

The valence and metalcomplex behaviour of Pu with selected organic substances in the environment were investigated. Hexavalent Pu was unstable in the presence of fulvic acid, polygalacturonic acid, and alginic acid. Citrate-Pu(VI) complexes were more stable and Pu(IV) was the most stable valence in interaction with these compounds. A more feasible oxidation state change appears to be reduction to Pu(III), however, the acidity of the reducing environment is critical and Pu(IV) reduction does not appear to occur above pH 6.0 at normally encountered redox conditions of anaerobic systems. The soil-resin transfer studies indicated that after 30 years, a substantial fraction of the Pu in the contaminated soil does not readily desorb under conditions favoring exhaustive removal. Considering the very strong Pu interaction with the solid phase soil it appears that leaching losses of Pu will be insignificant compared to physical movement of contaminated particles. (See also W76-08597) (Chilton-ORNL)
W76-08605

PLUTONIUM AND AMERICIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W76-08606

PLUTONIUM RADIONUCLIDES IN THE GROUNDWATERS AT ENEWETAK ATOLL,
California Univ., Livermore. Lawrence Livermore Lab.
V. E. Noshkim, K. M. Wong, K. Marsh, R. Eagle, and G. Holladay.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 517-543, 7 fig, 12 tab, 18 ref. W-7405-ENG-48.

Descriptors: *Environmental effects, *Radioisotopes, *Plutonium, *Groundwater, Atells, Cesium, Freshwater, Reservoirs.

Chemical and radiochemical data is provided for the assessment of water quality on selected islands of the Enewetak Atoll which have been designated for rehabilitation. Data shows that small quantities of plutonium radionuclides have migrated through the soil and are redistributed throughout the groundwater reservoirs. The maximum surface concentrations found were less than 0.02% of the maximum recommended concentration for drinking water. Cs 137 concentrations were found to correlate with water freshness. Mechanisms which move Pu 239, 240 through the groundwater reservoirs were found to be independent of the processes controlling the cycling of Cs 137 and fresh water. A linear correlation was found between mean surface-water concentrations and soil burdens. Quantities of Pu 239, 240 migrating to the groundwater did not correlate with any known differences in the physical, chemical or biological characteristics of the area. (See also W76-08597) (Chilton-ORNL)
W76-08607

THE RESPONSES OF SOILS AND SOIL MICROORGANISMS TO SILVER IODIDE WEATHER MODIFICATION AGENTS,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W76-08670

CALCULATED DRAINAGE WATER COMPOSITIONS AND SALT BURDENS RESULTING FROM IRRIGATION WITH RIVER WATERS IN THE WESTERN UNITED STATES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. D. Oster, and J. D. Rhoades.
Journal of Environmental Quality, Vol. 4, No. 1, p 73-79, January-March 1975. 4 fig, 3 tab, 25 ref.

Descriptors: *Model studies, *Simulation analysis, Lysimeters, Alfalfa, Leaching, Return flow, Salinity, Saline water, Irrigation water, *Drainage water, Salts, Rivers.

Drainage water compositions were calculated with a computer simulation model from irrigation water compositions, leaching fractions, aragonite and gypsum solubilities, and measured partial pressure of CO(2). The calculated compositions were compared with measured values obtained from lysimeters filled with Pachappa soil, cropped with alfalfa, and irrigated with eight synthetic waters typical of rivers in the western U.S. Linear regression analysis of predicted vs. measured values for Na(+) and SO4(2-) concentrations, sodium-adsorption-ratio, electrical conductivity, and salt burden resulted in essentially one-to-one relationships. The gain in salt burden of drainage water at high leaching fractions due to mineral dissolution was adequately described by assuming the soil solution was saturated with respect to aragonite. Some evidence for Mg(2+) precipitation was found. The utility of the simulation model is demonstrated for evaluating the salinity, sodicity, and pollution hazards of irrigation waters. (Skogerboe-Colorado State)
W76-08671

PHOSPHORUS MOVEMENT IN SOILS: SOIL-ORTHOPHOSPHATE REACTION KINETICS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
L. T. Novak, and D. C. Adriano.
Journal of Environmental Quality, Vol. 4, No. 2, p 261-266, April-June 1975. 5 fig, 3 tab, 20 ref, append.

Descriptors: *Model studies, *Adsorption, *Phosphorus, *Waste water treatment, Soil water, Soil chemical properties, Soil chemistry, Kinetics.
Identifiers: *Desorption, Orthophosphates.

Four models are presented to describe the kinetics of P adsorption-desorption reactions in soils. The mass transfer model, Langmuir kinetics model, and Langmuir-Hinshelwood models were developed and compared with phosphate adsorption data on a soil obtained by batch-shaken flask experiments. For P adsorption times up to 3 hours, the mass transfer and Langmuir kinetics models described the experimental data very well. The Langmuir kinetics model gave a slightly better fit of the experimental data. These kinetic data probably represent an upper bound for unsaturated flow in soils. (Skogerboe-Colorado State)
W76-08672

EFFECTS OF FOREST FERTILIZATION ON TWO SOUTHEAST ALASKA STREAMS,
National Environmental Research Center, College, Alaska. Arctic Environmental Research Lab.
W. R. Meehan, F. B. Lotspeich, and E. W. Mueller.
Journal of Environmental Quality, Vol. 4, No. 1, p 50-55, January-March 1975. 7 fig, 9 ref.

Descriptors: *Water quality, *Alaska, *Nitrogen, Watersheds(Basins), *Fertilization, Forest management, Streams.
Identifiers: Stream pollution, *Forest fertilization.

Four streams in southeast Alaska were studied to determine the effects of forest fertilization with urea on basic productivity and water quality. An initial, short-term increase in ammonia-nitrogen levels was observed in the treated streams, and nitrate-nitrogen levels increased and remained high compared to control stream levels during the year following treatment. Concentrations did not approach those considered toxic to aquatic life or unsafe for human consumption. Changes in biomass of periphyton and benthic fauna as a result of fertilization were not detected. (Skogerboe-Colorado State)
W76-08673

THE IMPACT OF MOLYBDENUM-ENRICHED IRRIGATION WATER ON AGRICULTURAL SOILS NEAR BRIGHTON, COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
D. R. Jackson, W. L. Lindsay, and R. D. Heil.
Journal of Environmental Quality, Vol. 4, No. 2, p 223-229, April-June 1975. 10 fig, 4 tab, 25 ref.

Descriptors: *Irrigation water, *Molybdenum, *Soil chemistry, Soil investigations, Agriculture, Colorado, Alfalfa, Water pollution sources.

The Mo concentration in water, soils, and alfalfa was monitored for one growing season to determine the impact of using Mo-enriched irrigation water near Brighton, Colorado. The concentration of Mo in irrigation water in this area ranged from 27 to 213 ppb. A significant increase of Mo concentration in alfalfa and available soil Mo was observed at one site irrigated with water containing 213 ppb Mo. The Mo concentration in the alfalfa at this site increased during the growing season from 4.3 to 7.2 ppm. This level is below the 10 ppm level considered toxic to livestock. Plant Mo was highly correlated (r=0.94) with resin-extractable Mo in a greenhouse experiment using soils from three of the field sites. Field results were less satisfactory (r=0.51), partially due to limited indigenous levels of Mo in the soils. A simulation model was used to assess the potential hazards of irrigating with water containing from 0 to 600 ppb Mo. The impact of Mo on the Brighton area during one growing season was minimal in relation to uptake of Mo by plants. Further studies are necessary to assess the long term effects of Mo accumulation in soils and irrigated with Mo-enriched waters. (Skogerboe-Colorado State)
W76-08675

COMPARISON OF TWO PREDICTIVE NONEQUILIBRIUM ONE-DIMENSIONAL MODELS FOR PHOSPHORUS SORPTION AND MOVEMENT THROUGH HOMOGENEOUS SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
C. G. Enfield, and D. C. Shew.
Journal of Environmental Quality, Vol. 4, No. 2, p 198-202, April-June 1975. 5 fig, 1 tab, 21 ref.

Descriptors: *Phosphorus, *Sorption, *Diffusion, *Simulation analysis, *Model studies, Kinetics, Soil chemistry, Soil investigations, Agriculture, *Path of pollutants.
Identifiers: *Phosphorus sorption.

Two models were tested for their ability to predict phosphorus breakthrough curves. The basic difference between the two models is the method of describing the kinetics of sorption. It was found, when comparing theoretically predicted breakthrough curves with experimental breakthrough curves, that the model using a kinetic equation produced a better fit to the experimental data than a first order rate equation. (Skogerboe-Colorado State)
W76-08677

THE NITROGEN BALANCE OF ARCTIC TUNDRA: PATHWAYS, RATES, AND ENVIRONMENTAL IMPLICATIONS,
Alaska Univ., College. Inst. of Marine Science.
R. J. Barsdate, and V. Alexander.
Journal of Environmental Quality, Vol. 4, No. 1, p 111-117, January-March 1975. 3 fig, 5 tab, 43 ref.

Descriptors: *Nitrogen, *Alaska, *Leaching, *Denitrification, Ecosystems, *Path of pollutants, Arctic.
Identifiers: *Arctic ecosystems.

The magnitude of the inputs and exports of nitrogen was extimated for the tundra ecosystem at Barrow, Alaska. Based on new data and on previous investigations, annual input of nitrogen from all sources was 92.4 mg N/m(2) per year, with the most important sources being nitrogen fixation (75%) and ammonia in summer rain (18%). The low input of nitrogen by rain and snow results from both low annual precipitation and extremely low concentrations of nitrogen compounds in precipitation. Despite the meager nitrogen supply, the estimated retention is over 80% of the input reflecting insignificant leaching due to the impermeable permafrost substrate, low precipitation, and restricted lateral movement of water over and through the nonfrozen soils. Denitrification also is low, at least partially due to nutrient deficiency. Interpretations of these data in respect to the sensitivity of the environment to perturbations suggest that resource development or other activities which would have minor or negligible effects in temperate latitudes, could alter substantially the nitrogen balance of this arctic ecosystem. (Skogerboe-Colorado State)
W76-08678

WATER QUALITY IN IRRIGATED WATERSHEDS,
California Univ., Riverside. Dept. of Soil Science Agricultural Engineering.
R. L. Branson, P. F. Pratt, J. D. Rhoades, and J. D. Oster.
Journal of Environmental Quality, Vol. 4, No. 1, p 33-40, January-March 1975. 1 fig, 5 tab, 40 ref.

Descriptors: *Return flow, Irrigation, *Irrigation effects, Drainage water, *Agricultural watersheds, Surface runoff, *Water quality, Irrigation water, Watershed management.

Historically, attention to water quality in irrigated watersheds has been focused on irrigation waters and the relationships of their chemical composition to soil permeability and crop production. Recently, because of environmental concerns, it has become necessary to look beyond the quality of irrigation waters and consider also the quality of waters that drain from irrigated lands. Irrigation agriculture affects drainage-water chemical composition. In turn, drainage waters can influence the quality of receiving waters which may have a variety of beneficial uses to be protected. The two types of drainage waters from irrigated lands, surface runoff and subsurface drainage or percolation water, are characteristically different in composition and chemical concentration. The pollution potential of subsurface drainage waters, with respect to nitrate and total soluble salts is a particular concern. Studies of individual field conditions are providing information that can be extrapolated to show the effects of watershed management on ultimate water quality in receiving stream or ground water. A new concept has been developed concerning irrigation water management to minimize the quantity of salt discharged from irrigated lands and thereby help alleviate water quality degradation associated with disposal of salt-laden subsurface drainage waters. (Skogerboe-Colorado State)
W76-08679

NITRATE, PHOSPHATE, AND POTASSIUM MOVEMENT INTO DRAINAGE LINES UNDER THREE SOIL MANAGEMENT SYSTEMS,
Florida Univ., Fort Pierce. Inst. of Food and Agricultural Science.
D. V. Calvert.
Journal of Environmental Quality, Vol. 4, No. 2, p 183-186, April-June 1975. 3 fig, 4 tab, 13 ref.

Descriptors: *Nitrates, *Phosphates, *Potassium, *Drainage water, *Drainage, *Leaching, Lime, Soil investigations, Fertilizers, Irrigation, Agriculture, Florida, Soil management.
Identifiers: *Tillage depth, Orthophosphates.

Nitrate, orthophosphate, and potassium concentrations in drainage water were determined from subsurface drains installed in shallow-tilled (ST), (15 cm); deep-tilled (DT), (107 cm); and deep-tilled and limed (DTL) Florida Oldsmar sand planted to citrus. Total discharge of NO(3)-N was significantly greater from ST plots than either DT or DTL plots. Peak concentrations and discharge of fertilizer nutrients were shown to be a function of rainfall, irrigation, and timing of fertilizations. Deeply incorporated limestone applications into the subsoil tended to increase the NO(3)-N and decrease PO(4)-P discharged over that from deep tillage alone. (Skogerboe-Colorado State)
W76-08680

CHLORINATED HYDROCARBON PESTICIDES AND MERCURY IN COASTAL BIOTA, PUERTO RICO AND THE U.S. VIRGIN ISLANDS--1972-74,
Georgia Univ., Brunswick. Marine Resources Extension Center.
R. J. Reimold.
Pesticides Monitoring Journal, Vol. 9, No. 1, p. 39-43, 1975. 2 fig., 2 tab., 9 ref.

Descriptors: *Pesticide residues, *Baseline studies, *Mercury, *Chlorinated hydrocarbon pesticides, *Biota, Coasts, *Puerto Rico, *Virgin Islands, DDT, DDE, Dieldrin, Estuaries, Aroclors.
Identifiers: Carribean.

A biannual survey of selected Caribbean coastal waters off Puerto Rico and the Virgin Islands (St. John, St. Thomas, and St. Croix) was initiated in 1972 to determine the concentrations of chlorinated hydrocarbon pesticides (dieldrin, DDT, DDE, TDE, and polychlorinated biphenyls) and mercury in estuarine and marine fauna and

flora. Of 150 biota samples studied, 41% had significant amounts of mercury or chlorinated hydrocarbons. The concentrations suggested spatial and temporal variations in plants and animals. Sometimes the residues in the biota could be related to land-use practices in the watershed. DDT and dieldrin had been used on St. John's Island near Coral Bay for an insect control program and were found in fauna collected in the bay. Aroclor 1254 was found in red mangroves on the west side of St. Croix; the source is not known, but because of the distribution patterns and because residues were present at low trophic levels in the primary producers and detrivores, the source may have been local. As yet it is not possible to determine if the concentrations of the pollutants measured in these studies are increasing, decreasing, or remaining constant. However, these data do establish baseline conditions for future comparisons in these relatively uncontaminated areas. (Buchanan-Davidson-Wisconsin).
W76-08683

LAKE ERIE AND ITS BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-08723

CONTINUOUS DYNAMICAL COMPUTATIONS OF WATER TRANSPORTS IN LAKE ERIE FOR 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-08724

SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08725

RATES OF ACCUMULATION OF PHOSPHORUS FORMS IN LAKE ERIE SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08726

CULTURAL IMPACT ON THE GEOCHEMISTRY OF SEDIMENTS IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08727

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ. Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis, D. R. Anderson, and J. A. Dracup.
Water Resources Bulletin, Vol. 12, No. 1, p 157-174, February 1976. 4 fig, 1 tab, 17 ref.

Descriptors: *Water quality control, Analytical techniques, *Model studies, *Systems analysis, *Oxygen demand, *California, Numerical analysis, Reaeration, Photosynthesis, Computer models, Data processing, *Nitrogen cycle, Nutrients, Environmental engineering, Water quality, Management, Streams, Canals, Waste assimilative capacity.
Identifiers: *Organic nitrogen, *Truckee River(Calif), Implicit finite difference approximation.

A general planning model for simulation of water quality in streams and canals was formulated and verified. The model simulated the temporal and spatial variations in conservative and nonconservative constituents. The nitrogen cycle and its interaction with other nutrients and the dissolved oxygen resources of the stream were included. A fully implicit finite difference approximation was used to solve the mass transport equations describing variations in constituent concentrations throughout the stream systems. The model is a flexible planning tool for the rapid evaluation of transient water quality conditions in streams and rivers. Treatment levels and quality conditions throughout the system can be easily varied by the planner or system manager. The model was applied to the Truckee River in northern California. Results indicated the applicability of the model for assessing the impact of alternative water quality management strategies on the stream system. Although the data requirements are substantial, the model provides the planner for arriving at satisfactory water quality control measures. (Singh - ISWS)
W76-08730

ONE-DIMENSIONAL TEMPERATURE PREDICTIONS IN UNSTEADY FLOWS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. N. Brocard, and D. R. F. Harleman.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11982, p 227-240, March 1976. 5 fig, 14 ref, 2 append. EPA R-800429.

Descriptors: *Model studies, *Thermal pollution, *Heat transfer, *Mathematical models, *Forecasting, Powerplants, Cooling water, Rivers, Reservoirs, Estuaries, Temperature, Water temperature, *Unsteady flow, Water quality, Dispersion, Meteorology, Hydraulics.
Identifiers: Waste heat.

One-dimensional temperature models are useful in assessing the environmental impact of waste heat discharges. The model considers both transient flow and meteorological conditions and is therefore applicable to actual rivers and estuaries. The equations governing the flow and the temperature distribution were reviewed and the role and determination of the dispersion coefficient was examined. The fluxes participating in the overall heat budget of a water body were individually considered and formulas were given to evaluate them. The nature of the necessary boundary conditions was considered and a case study was presented where the natural temperature distribution in the Conowingo Reservoir was predicted and compared to actual measurements. (Sims - ISWS)
W76-08738

NUMERICAL PREDICTION OF THERMAL-REGIME OF RIVERS,
Nalco Environmental Sciences, Northbrook, Ill. Physical Science Div.
P. P. Paily, and E. O. Macagno.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11997, p 255-274, March 1976. 8 fig, 2 tab, 6 ref, 3 append. NSF GK-35910X.

Descriptors: *Model studies, *Thermal pollution, *Heat transfer, *Mathematical models, *Forecasting, Rivers, Powerplants, Cooling water, Temperature, Water temperature, Unsteady flow, Water quality, Winter, Ice, Meteorology, Hydraulics, Hydrodynamics, Mississippi River, Illinois.
Identifiers: Waste heat.

The one-dimensional form of the unsteady convection-diffusion equation adequately describes the thermal-regime of rivers for fully mixed flow conditions. In general, it is not easy to develop closed-form solutions of this nonlinear partial parabolic equation. Thus, a numerical solution, based on a predictor-corrector scheme, was developed for this equation, which can be applied for predicting the thermal response of natural and heated rivers under variable meteorological factors and transient thermal discharge and flow conditions. Result of a field investigation conducted in the Mississippi River near Cordova, Illinois, during winter was presented, along with a comparison of the measured and predicted steady-state temperature distributions in the river. (Sims - ISWS)
W76-08739

THREE-DIMENSIONAL POLLUTANT MODELING IN SHEAR FLOW,
Tetra Tech, Inc., Pasadena, Calif.
G. T. Yeh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 12005, p 351-365, March 1976. 4 fig, 1 tab, 14 ref, 2 append.

Descriptors: *Model studies, *Water pollution sources, *Turbulent flow, Mathematical models, Diffusion, Rivers, Pollutants, Flow, Turbulence, Shear, Mixing, Hydraulics.
Identifiers: *Shear flow, Three-dimensional models.

A steady-state three-dimensional turbulent diffusion equation with variable coefficients describing the concentration distribution of a substance from a point source in a shear flow field was solved analytically. A similar formulation may be developed for line, area, or other kinds of sources. Two models were considered: one treats both the depth and width of the water body as finite, while the other deals with finite depth but with infinite width. In the search for solutions, the integral transformation and the Green's function constructed earlier by the writer were utilized to the optimum advantage. The solutions were developed for cases in which the velocity and the vertical and lateral eddy diffusion coefficients were given by a power law. Results were compared with those obtained from the uniform flow field. They showed a significant difference in the concentration distribution. The magnitude of differences depends on the location of sources and the vertical variations of the velocity and the diffusion coefficients of the flow field. (Sims - ISWS)
W76-08740

DISTRIBUTIONS OF BOD AND DO IN RIVERS AND LAKES,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
R. B. Banks.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE2, Proceedings Paper 12028, p 265-280, April 1976. 12 fig, 17 ref, 2 append.

Descriptors: *Biochemical oxygen demand, *Dissolved oxygen, *Mexico, Surface waters, Environmental engineering, *Mathematical models, Aeration, Waste treatment, Oxygen, Oxygen requirements, Water circulation, Water pollution, Organic matter, Water quality, Lakes, Rivers, Model studies, Industrial wastes, Agricultural runoff, Equations, *Distribution patterns.
Identifiers: BOD distributions, DO distributions, *Lake Chapala(Mexico), *Oxygen sag, Deoxygenation, Mixing cell model, Velocity distributions.

The differential equations for horizontal distributions of biochemical oxygen demand (BOD) and dissolved oxygen (DO) were presented. In general, these equations cannot be solved. Therefore, a mixing cell model was developed, based on the assumption that the concentrations of BOD and DO throughout a cell are equal to their concentrations in the effluent from the cell. Two examples were given: (1) flow from a source and (2) flow from an infinite row of sources. Results obtained with the mixing cell model agreed closely with results given by solutions to the differential equations. The method was employed to determine distributions of BOD and DO in Lake Chapala, Mexico. Computed values were in fair agreement with measured values. (Henley-ISWS)

W76-08743

COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
R. H. Rogers, L. E. Reed, and V. E. Smith.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-26465, $3.50 in paper copy, $2.25 in microfiche. Special Report BSR 4183, March 1975. 15 p, 6 fig, 1 tab, 8 ref. NASA NAS5-20942.

Descriptors: *Water quality, *Lake Huron, Computers, *Satellites(Artificial), *Data collections, Remote sensing, *Turbidity, Physical properties, *Mapping, Water circulation, Nutrients, Dissolved solids, Heavy metals, Chlorophyll, Algae, Sampling, On-site data collections.
Identifiers: *Saginaw Bay(Mich), *ERTS, Clarity.

Computer techniques developed for mapping water quality parameters from ERTS data were demonstrated, using ground truth collected in an ongoing survey of water quality in Saginaw Bay, Michigan (Lake Huron) sponsored by the U. S. Environmental Protection Agency. Chemical and biological data were collected in concert with ERTS passes at 59 bay stations within the 2960 square kilometer test area. These ground truth measurements include water turbidity and clarity, chlorophyll, algal populations, total and dissolved nutrients, and metals. A technique for transforming Earth coordinates (latitude and longitude) of bay stations to ERTS tape coordinates (scan line and element number) was developed and applied to edit ERTS measurements near stations representative of a known water quality parameter. These spectral samples were used by the computer to produce geometrically-corrected color-coded imagery and maps of turbidity of the entire bay. These maps show nine discrete categories of turbidity, as indicated by nine Secchi depths between 0.3 and 3.3 meters. These maps and data, rapidly produced from ERTS data, provide an economical basis for extrapolating water quality parameters from point samples to unsampled areas. Furthermore, ERTS furnishes a synoptic view of water mass boundaries that no amount of ground sampling or monitoring can provide. (Morris-ISWS)
W76-08746

WATER QUALITY EFFECTS OF A DREDGING DISPOSAL AREA,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 5C.
W76-08749

5C. Effects Of Pollution

BIOLOGICAL PROBLEMS OF A MANMADE SMALL LAKE, (IN GERMAN),
Innsbruck Univ. (Austria). Hygienisches Institut.
F. Tiefenbrunner, and E. Rott.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 160(3), p 268-285, 1975.

Descriptors: Lakes, *Algae, Biology, *Eutrophication, Europe, Hydrogen ion concentration, Seasonal, *Phytoplankton, Chlorophyta, *Phosphorus, *Artificial lakes.
Identifiers: Cyclotella, Microcystis-Flos-Aquae, Synedra.

A small bathing lake with (surface area = 3000 m2; volume = 7000 m3) which has been in existence for over 10 yr was studied July-Sept. A relatively constant H+ concentration (pH 8.2), small variations in electrolytic conductivity and 8 German degrees of hardness were found. The mean P level was 60 micrograms/l. The Pi levels ranged between 5.2-18.5 micrograms/l. O2-Saturation during the entire summer was greater than 100%. Altogether, 49 kinds of phytoplankton and 12 kinds of zooplankton were identified. The total biomass of phytoplankton was between 8.5-16 mg fresh weight/l; bacterial biomass varied between 4.5-9.5 mg/l. Unusual for summer conditions was the high proportion of Cyclotella and Synedra spp. among the phytoplankton mass; the algal bloom-producing Microcystis flos-aquae attained a maximum proportion of 15%. In spite of the variety of forms, green algae were present in small numbers only. According to various classification systems, the lake is eutrophic or b-mesosaprobic. The lake is probably rich in nutrients, but there is a relatively stable biological equilibrium so that there is no further threat of progressive eutrophication.--Copyright 1976, Biological Abstracts, Inc.
W76-08107

ADENOSINE TRIPHOSPHATASE ACTIVITY IN BRAIN, INTESTINAL MUCOSA, KIDNEY, AND LIVER CELLULAR FRACTIONS OF THE RED-EARED TURTLE FOLLOWING IN VITRO TREATMENT WITH DDT, DDD, AND DDE,
Middle Tennessee State Univ., Murfreesboro. Dept. of Biology.
F. G. Witherspoon, Jr., and M. R. Wells.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 5, p. 537-544, 1975. 4 fig., 7 ref.

Descriptors: *DDT, *DDD, *DDE, *Inhibition, Inhibitors, *Turtles, Biochemistry, *Enzymes, Analytical techniques, *Chlorinated hydrocarbon pesticides, Water pollution effects, *Toxicants, Mode of Action, Animal physiology, Pesticides, Insecticides, Phosphorus, Environmental effects, Cytological studies, Pollutant identification.
Identifiers: Tissue analysis, *Adenosine Triphosphate, Cellular components, Chrysemys scripta elegans.

Adenosine triphosphatase (ATPase) activity in cellular fraction of turtle tissues was determined by measuring the amount of inorganic phosphate produced by the conversion of ATP to ADP. DDT, DDD or DDE in concentrations of 53, 106 and 212 micromoles was added to the tissue homogenates. The data indicate highly significant inhibition of the (Na+, K+, Mg+2) dependent ATPase systems in all cellular fractions of the kidney, intestinal mucosa and brain (except for mitochondria in latter two) after in vitro treatment with 212 micromole DDT. DDE exhibited an unexpectedly high inhibitory effect and DDD did not share sites of inhibition with either DDT or DDE. This suggests a different mechanism of action. (Katz)
W76-08115

NITROGEN AND PHOSPHORUS LOSSES FROM WINTER DISPOSAL OF DAIRY MANURE,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
S. D. Klausner, P. J. Zerman, and D. F. Ellis.
Journal of Environmental Quality, Vol 5, No 1, p 47-49, 1976. 2 fig, 3 tab, 16 ref. EPA S800767.

Descriptors: *Nitrogen, *Phosphorus, *Surface runoff, *Farm wastes, Fertilization, New York, Winter, Agricultural runoff, Freezing, Rates of application, Snow cover, Thawing.

Surface runoff losses of inorganic nitrogen and total soluble phosphorus from fields at the Cornell Research Farm, Aurora, New York, winter fertilized by dairy manure were measured from January 1-March 31 in 1972, 1973, and 1974. Of primary importance were the rate of manure application (35, 100, and 200 metric tons/ha) and climatological variability. The average values of inorganic nitrogen in the liquid fraction of runoff for the three rates of application were 16, 1, and 0.2 kg/ha for the three years, respectively, and the average phosphorus runoff values averaged 3.7, 0.7, and 0.01 kg/ha. The soil was frozen for 62, 12 and 0 days in the respective years, and the longest freeze period was mainly responsible for the increased nutrient concentrations in the runoff. The results suggest that manure distribution during active thaw periods could cause greatly increased loss of nutrients. Such losses would be minimized if the manure is applied, then covered with snow which melts at a later date. When 35 metric tons/ha of manure were applied on frozen soil and then covered with snow, the nutrient losses were not very different from losses from areas than received no manure. (Buchanan-Davidson--Wisconsin)
W76-08159

DISTRIBUTION OF PLUTONIUM IN SOIL PARTICLE SIZE FRACTIONS OF LIQUID EFFLUENT-RECEIVING AREAS AT LOS ALAMOS,
Los Alamos Science Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W76-08160

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
G. Wood.
Australian Water Resources Council Technical Paper No. 15, 1975. 238 p. 8 fig., 16 tab., 585 ref.

Descriptors: *Eutrophication, *Australia, *Reviews, Water pollution control, Management, Research facilities, Water pollution effects.

Discussed in detail are the Australian environment, recent foreign eutrophication research, the basic concepts of trophic status and their applicability to Australian inland waters; the effects and problems associated with eutrophication, eutrophication problems in Australia, nutrient and other parameters contributing to the eutrophication process, including factors considered to be of particular importance in Australia. Attention is also focused on indices and measurement of eutrophy of Australian waters, management and control of eutrophication both in foreign countries and Australia, and the status of eutrophication in Australia, including current studies. The arid Australian climate with erratic and variable rainfall poses unique problems for that continent. Rivers, streams, lakes, coastlines, and underground aquifers are being polluted to the extent that some waterways can no longer be used except as sewers. A contributing factor is the population density on the coastlines, with annual growth of 2% per annum, and increasing urbanization inland. The lack of Australian research on limnology and eutrophication imperils its water resources. Some recommendations are that research on all aspects of limnology and baseline data be accelerated; enhanced communication between researchers with prompt publication of research results; and that a central depository be maintained in each state and territory for all pertinent literature. (Auen-Wisconsin)
W76-08162

AN ECOLOGIC SURVEY OF LAKE ENDINE, (IN ITALIAN),
L. Barbanti, C. Bonacina, A. Calderoni, A. Carollo, and R. De Bernardi.
304p. Edizioni dell'Istituto Italiano di Idrobiologia: Italy. 1974.

Descriptors: *Ecology, *Surveys, Lakes, Europe, *Phytoplankton, Primary productivity, Seasonal, Distribution, Benthos, Water pollution, Zooplankton.
Identifiers: Macrophytes, *Italy(Lake Endine).

Hydrological, meteorological and physicochemical data on this Italian lake are provided. A list of phytoplanktonic species is given and primary

production examined. Seasonal variation and distribution of macrophytic, zooplanktonic and benthic organisms were studied in relation to pollution of the lake and its control.--Copyright 1976, Biological Abstracts, Inc.
W76-08244

ECOLOGY OF THE ZOOPLANKTON IN THE GULF OF CARIACO. PART I: VARIABILITY OF THE BIOMASS OF THE ZOOPLANKTON DURING THE PERIOD FROM AUGUST TO NOVEMBER, 1973, (IN SPANISH),
Indian Ocean Biological Centre, Cochin (India); and National Inst. of Oceanography, Cochin (India).
T. S. S. Rao, and L. J. Urosa.
Bol Inst Oceanogr Univ Oriente Cumana. 13(1/2), p 67-78, 1974.

Descriptors: *Biomass, *Zooplankton, Productivity, *Ecology, Gulfs, Standing crops.
Identifiers: *Venezuela(Gulf of Cariaco).

Zooplankton biomass values are given, based on 119 collections made during Aug.-Nov. 1973. This period represents the lean period of zooplankton production and standing crop in the Gulf (Venezuela), against a background of stable hydrographic conditions. Values were subjected to statistical analysis and the data probably represent a valid estimate of zooplankton biomass. Biomass varied between 64.2 and 142.6 cc/1000 m3, indicating that the Gulf has high zooplankton standing crop as compared to other areas. The ratio between displacement volume, wet weight and dry weight, is compared with results obtained elsewhere and there are wide differences.--Copyright 1976, Biological Abstracts, Inc.
W76-08247

NEW METHODS FOR ECOLOGICAL ANALYSIS OF MICROORGANISMS OF EUTROPHIC WATERS, (IN SPANISH),
Institute National de Limnologia, Santo Tome (Argentina).
For primary bibliographic entry see Field 5A.
W76-08252

INFLUENCE OF THE LOCAL PRECIPITATION QUANTITY ON THE LOADING OF WATER BODIES WITH MIXED WATER (DER EINFLUSS DER OERTLICHEN NEIDERSCHLAGSHOEHE AUF DIE BELASTUNG DER GEWAESSER MIT MISCHWASSER),
For primary bibliographic entry see Field 5B.
W76-08258

TOXIC ACTION OF COPPER ON THE GILLS OF CARP (CYPRINUS CARPIO), (IN FRENCH),
Lab. Ecophysiol. Anim., Univ. Paul-Sabatier, Toulouse, Fr.
R. Labat, J. Pequignot, and A. Chatelet.
Ann Limnol. 10(1); p 109-114, 1974.

Descriptors: *Carp, *Copper, Toxins, Fish toxins, Water pollution effects, *Toxicity.
Identifiers: *Gills(Carp).

Histological changes in carp gill structure were observed after poisoning by copper salt. Cu (an environmental toxicant) induced mucous cell depletion, followed by mucosecretion inhibition, recovering only after a return to normal conditions.--Copyright 1975, Biological Abstracts, Inc.
W76-08260

BIOLOGICAL CHANGES IN THE SOUTH ST. PAUL SEWAGE TREATMENT PLANT BEFORE AND AFTER TREATMENT WITH FECL3 AND NALCOLYTE 675 COAGULATING AGENTS,
Saint Cloud State Coll., Minn. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W76-08290

STUDIES ON THE HOST SPECIFICITY OF THE EYEFLUKE DIPLOSTOMUM SPATHACEUM, IN BROWN AND RAINBOW TROUT,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
C. Betterton.
Parasitology. 69(1), p 11-29, 1974.

Descriptors: *Rainbow trout, *Brown trout, *Fish diseases, Europe, Fish parasites, Fish migration, Fish forming.
Identifiers: Diplostomum-Spathaceum, England, *Eyefluke.

Trout collected from a trout farm in Essex, England, were infected with D. spathaceum. Yearling rainbow trout were blinded with heavy infections of eyefluke, whereas brown trout of the same age carried 1/10 the number of flukes and were clear eyed. Both species were reared under identical conditions, in parallel rearing channels which received water from a common source. Young fish exhibited a similar differential in their infestations, and rainbow trout did not appear to be age-resistant. Laboratory infections produced by exposure of fish to suspensions of cercariae and injection of cercariae into the body cavity reflected the field results, indicating that ecological factors were not involved. Recovery of cercariae from host tissues, and histological observations of similar numbers entering both hosts, showed that cercariae were able to survive penetration. Excised eye preparations were equally susceptible to infection. Fry (2 cm) of both species were highly susceptible. Migration in brown trout took 3 h longer than in rainbow trout of the same size; many cercariae were found in the heart during this time. Two mechanisms of insusceptibility were suggested: a greater impenetrability of brown trout tissues and disorientation of migrating cercariae in brown trout.--Copyright 1975, Biological Abstracts, Inc.
W76-08302

THE EFFECT OF CONTROLLED EUTROPHICATION ON SOLAR RADIATION PENETRATING INTO PONDS, (IN POLISH),
Polish Academy of Sciences, Golysz. Fish Culture Station.
M. Szumiec.
Acta Hydrobiol. 17(2), 149-181, 1975.

Descriptors: *Eutrophication, *Ponds, *Solar radiation, Lakes, Distribution patterns, Europe, Fish, Production, Surfaces.
Identifiers: *Poland, Solar energy(Ponds).

Time and vertical solar energy distribution in ponds depends on the solar radiation of the surface and on changes of water transparency resulting from variable intensification of fish production. The possibility of theoretical calculations of the solar energy at the pond surface under local conditions was checked, the daily and seasonal cycles being analyzed. The field of solar radiation inside the ponds was presented as a continuous function of time and depth. The results concerning the characterization of time and vertical distribution in the solar radiation in Polish lakes are discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-08305

FOOD HABIT OF VORTICELLIDAE ISOLATED FROM ACTIVATED SLUDGE,
Tokyo Univ. (Japan). Inst. of Applied Microbiology.
For primary bibliographic entry see Field 5D.
W76-08309

PLANKTONIC ECOSYSTEMS: THE EFFECTS OF DYSTROPHIC CONDITIONS ON STRUCTURE AND FUNCTION IN THE GULF OF FOS, (IN FRENCH),
Aix-Marseille-Univ. (France). Laboratoire d'Hydrobiologie.
F. Blanc, M. Leveau, and M. C. Bonin.
Int Rev Gesamten Hydrobiol. 60(3), p 359-378, 1975.

Descriptors: *Ecosystems, Gulfs, Plankton, *Diatoms, *Dinoflagellates, Primary productivity, Zooplankton, Europe, *Dystrophy, Effluents, Industrial wastes.
Identifiers: Acartia, Exuviaella, Prorocentrum, Skeletonema-Cos-tatum, *France(Gulf of Fos).

In the areas studied, an unusual structure and dynamic behavior was exhibited by the plankton ecosystems, due to industrial and natural effluents from the Rhone and Durance (France). The ecosystem is at a low state of maturity, characterized by frequent periods of intense multiplication by small species with high metabolic rates, such as the diatom Skeletonema costatum and the dinoflagellates Exuviaella and Prorocentrum. Brackish water seems to support their proliferation. The turnover rates of the populations decrease as they become older and cell size increases. A lack of competition by species of the same genus is a characteristic of the photoautotrophic organisms in these environments. Secondary production follows the same cycle as the primary production by the dinoflagellate population. Zooplankton (Acartia) have periods of intensive development in these areas.--Copyright 1976, Biological Abstracts, Inc.
W76-08312

FINE-DISPERSED FRACTION OF SUSPENDED ORGANIC MATTER IN THE EAST PACIFIC WATERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Insstitut Okeanologii.
I. A. Mel'nikov.
Okeanologiya. 15(2), p 266-271, 1975.

Descriptors: *Organic matter, *Suspended solids, Pacific Ocean, Eutrophication, Distribution, Food chains, Plankton, Detritus.
Identifiers: Heterotrophic organisms, *Organic carbon.

In the euphotic zone of the highly productive water this fraction comprises 86%, in the less productive water it is 61%, and below 200 m it is 53% of the organic C of suspended matter. The formation of the fine-dispersed fraction and its role in the energy distribution of the detritus food chain in the ecosystem (heterotrophic single-celled organisms, filtering plankton, predators) are discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-08314

INTRODUCTION TO HYDROBIOLOGY. HYDROBIOLOGY: A COMPENDIUM FOR ENGINEERS AND NATURAL SCIENTISTS, (IN GERMAN),
D. Uhlmann.
345 p. Illus. VEB Gustav Fischer Verlag: Jena, East Germany. 1975.

Descriptors: *Hydrobiology, *Metabolism, *Aquatic animals, *Growth rates, *Self purification, Bioindicators, Oxygen, *Sewage treatment, Waste water treatment, Inland waters, Temperature.
Identifiers: *Oxygen balance.

The 1st 2 sections examine the metabolism of aquatic organisms and the uniformity and biotope dependency of the growth of aquatic organisms. The 3rd chapter deals with faunal and floral colonization of flowing an stagnant inland waters and sludge stabilization, and part 4 concerns biological self-purification and the effect of artificial temperature control, indicator organisms and O2 balance. The function of water as a biochemical reactor, water pollutability, its reactions to disturbances and the repair of damaged aquatic ecosystems comprise the next 3 chapters. The ac-

tivities of the microorganisms used in sewage treatment plants and those of organisms present in water supply facilities constitute the final 2 sections.-Copyright 1976, Biological Abstracts, Inc.
W76-08315

DETERMINATION OF BIOLOGICAL DEGRADABILITY OF ORGANIC SUBSTANCES,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
For primary bibliographic entry see Field 5B.
W76-08351

A SIMPLE CONTINUOUS-FLOW RESPIROMETER FOR COMPARATIVE RESPIRATORY CHANGES IN MEDIUM-SIZED AQUATIC ORGANISMS,
Texas Christian Univ., Fort Worth. Dept. of Biology.
D. J. Arnold, and D. E. Keith.
Water Research, Vol. 10, No. 3, p. 261-263, 1976. 2 fig., 10 ref.

Descriptors: *Measurement, *Respiration, *Crustaceans, *Aquatic animals, *Fish, Metabolism, Equipment, Shiners, Crabs, Oxygen requirements, Salinity.
Identifiers: *Respirometers.

The respirometer is simple, inexpensive and can accommodate medium size animals (fish, crustaceans). Because low oxygen tensions and increases in metabolites can affect an organism's respiratory rate, a continuous-flow system which minimizes these effects is advantageous. The apparatus can be easily constructed, can be adapted to various flow rates, aquatic organisms, and experimental designs. Both this system and a static system, which used a series of sealed glass containers as closed respirometers, showed linear relationships between increasing numbers of golden shiners, Notemigonous crysoleucas, of the same size and weight, and oxygen consumption rate. The static system was satisfactory for small animals and simpler to operate, but the continuous-flow system was preferable for larger organisms. The continuous-flow system was used successfully to demonstrate effects of salinity changes on respiratory rates of the blue crab, Callinectes sapidus. There was a rapid increase in oxygen consumption at low salinities in crabs previously acclimated to 30% salinity, followed by a decrease to levels approximating respiration at 15% salinity. The continuous-flow method should be applicable to studies on the effects of industrial toxins on metabolic rates of aquatic animals. (Buchanan-Davidson--Wisconsin).
W76-08353

EUTROPHICATION OF MICROPONDS,
Agricultural Research Service, Fort Collins, Colo.
A. R. Batchelder.
Journal of Environmental Quality, Vol. 4, No. 4, p. 52-526, 1975. 3 fig., 6 tab., 14 ref.

Descriptors: *Eutrophication, *Nutrients, *Farm ponds, Bottom sediments, Soil types, Biomass, Soil chemical properties, Aquatic soils, Algae, Growth rates, Conductivity, Hydrogen ion concentration, Crop production.

In order to understand farm pond eutrophication, research was conducted to define mechanisms and magnitudes of nutrient regeneration from bottom sediments and to determine the effects of plants and other organisms on nutrient transfer mechanisms. Nutrient-supplying abilities of three soils, considered representative of farm pond-bottom soils, to overlying waters and effects of biomass production were studied. The soils, which had different chemical and physical properties, were flooded with deionized water and used as bottom soils for greenhouse microponds. The submeged soils supplied enough nutrients to overlying waters during two successive flooding of 219 and 270 days to sustain algal growth for 489 days. Electrical conductivities, pH, and nutrient concentrations differed between the soils and a control nutrient solution. Indigenous algae prevailed in the soil systems during the first flooding. The dominant algal genera were less diversified during the second flooding. When perennial rye grass was grown on the same soils, yields per kilogram soil could not be related to ash-free biomass yields per kilogram soil in the microponds. Algal growth could not be predicted from soil characteristics, solution composition, or cropped soil productivities, but submerged soils can serve as the sole source of algal nutrients. (Buchanan-Davidson--Wisconsin).
W76-08354

A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS,
Agricultural Research Service, Watkinsonville, Ga.
For primary bibliographic entry see Field 5B.
W76-08356

FACTORS AFFECTING THE CONTRIBUTION BY EPIPHYTIC ALGAE TO THE PRIMARY PRODUCTIVITY OF AN OLIGOTROPHIC FRESHWATER LAKE,
Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering.
R. B. Sheldon, and C. W. Boylen.
Applied Microbiology, Vol. 30, No. 4, p. 657-667, 1975. 5 fig., 7 tab., 31 ref. NSF AG-199, EMS 69-01147 A09

Descriptors: *Periphyton, *Limiting factors, *Primary productivity, *Carbon, Lakes, Algal, Growth rates, Diatoms, *New York, Aquatic plants, Water temperature, Light intensity, Bicarbonates, Seasonal, Littoral, Summer, Eutrophication, Winter, Photosynthesis, *Oligotrophy, Diurnal, Nutrients.
Identifiers: *Epiphytes, *Lake George(NY).

To determine factors limiting epiphyte growth and to measure their contribution to primary productivity, a diatom-dominated population of epiphytic algae was studied in Lake George, New York. Samples were taken during the spring, summer and fall at 3 m where macrophytes were most productive. Algae showed an optimum temperature for radioactive bicarbonate uptake at 30 C, but summer littoral lake temperatures were 18-25 C. Light saturation occurred at a 8,608 lux intensity, approximately the intensity at the depth where algae were found. Epiphytes showed a maximum photosynthetic capacity in the early afternoon in mid-August. They assimilated approximately 5% as much inorganic carbon as macrophytes from which they were obtained. Epiphyte population densities followed macrophyte seasonal growth patterns; maximal leaf colonization was essentially constant compared to leaf position on plants. There was little change in density between sampling sites at any given time. Epiphyte productivities from bottom leaves were 10-times higher than from top leaves. Phosphates, nitrates, ammonia, silica, and sulfates did not stimulate photosynthesis, but bicarbonates did, suggesting that carbon may be the limiting nutrient for the epiphytic algae in Lake George. The role of algal epiphytes on primary productivity becomes more important as aquatic ecosystems become more eutrophic. (Buchanan-Davidson--Wisconsin)
W76-08357

SELF-PURIFICATION CAPACITY OF IMPOUNDMENTS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
V. Straskrabova.
Water Research, Vol. 9, No. 12, p. 1171-1177, 1975. 3 fig, 5 tab, 28 ref.

Descriptors: *Self-purification, *Impoundments, *Biochemical oxygen demand, Eutrophication, Algae, Reservoirs, Organic loading, Organic matter, Equations, Inflow, Depth, Retention, Discharge(Water), Decomposing organic matter, Europe.

Recent eutrophication studies have emphasized the potential hazards of heavy algal productions in reservoirs which may interfere with the evaluation of the self-purification capacity. Statistical evaluations of data on organic matter budgets of reservoirs could suggest parameters governing the self-purification capacity. Total input of organic substances into impoundments includes inflow and algal production. With the same algal production per unit area, the relative importance of total input increases with decreasing mean depth, increasing retention time, and decreasing inflow concentration. The percentage of the total input remaining in the outflow is related to retention time. The amount remaining in the outflow is not affected by seasonal temperatures or autochthonous to allochthonous input ratio. Inflow concentration had no significant effect. In reservoirs with 19-203 day retention times, the percentage of organic matter in the outflow could be directly correlated with mean depth. In reservoirs with retention times up to 5 days, the biochemical oxygen demand in the outflow could be predicted from inflow known. Autochthonous production in reservoirs with longer retention times should be considered when predicting the outflow concentration. (Buchanan-Davidson--Wisconsin)
W76-08358

CHLORINATED PESTICIDES AND POLYCHLORINATED BIPHENYLS IN MARINE SPECIES, OREGON/WASHINGTON COAST, 1972,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 5A.
W76-08359

MERCURY CONCENTRATIONS IN FISH, NORTH ATLANTIC OFFSHORE WATERS--1971,
National Marine Fisheries Service, Milford, Conn. Milford Lab.
For primary bibliographic entry see Field 5A.
W76-08360

CONSIDERATIONS OF TESTING THE ACCUMULATION OF PESTICIDES BY MEANS OF ARTIFICIAL FOOD CHAINS,
Hamburg Univ. (West Germany). Institut fuer Hydrobiologie und Fischereiwissenschaft.
For primary bibliographic entry see Field 5A.
W76-08361

BEHAVIOUR OF OIL UNDER CANADIAN CLIMATIC CONDITIONS. PART 1. OIL ON WATER UNDER ICE-FORMING CONDITIONS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5B.
W76-08365

PYRAMID LAKE: ZOOPLANKTON DISTRIBUTION AND BLOOMS OF THE BLUE GREEN ALGA, NODULARIA SPUMIGENA,
Nevada Univ., Reno. Desert Research Inst.
D. Koch, L. Hoffman, and J. Mahoney.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 529, $4.50 in paper copy, $2.25 in microfiche. Water Resources Center, Project Report No. 38, January 1976. 46 p, 14 fig, 9 tab, 35 ref. OWRT B-069-NEV(1) 14-31-0001-4105.

Descriptors: *Eutrophication, Surface waters, Plankton, Water quality, Fish, Aquatic algae, *Nevada, *Zooplankton, *Cyanophyta, Distribution, Lakes, *Algal toxins, Water pollution effects.
Identifiers: *Pyramid Lake(Nev), Nodularia spumigena.

The interrelationships of the Pyramid Lake, Nevada algae bloom with zooplankton populations and fishes in the lake were studied. The objective was to evaluate the effect of the large Nodularia spumigena bloom upon the fishes indirectly through analysis of zooplankton populations during algae bloom. It is believed that algae produce toxins during bloom conditions; this study was implemented to determine if the algae do produce toxins and what influence they might have on the lower levels of the food chain. Results showed that looking at zooplankton and Nodularia populations structures together, the alga did not appear to produce a toxin that might indirectly influence larval fish through effects on zooplankton populations. When water temperature is highest in late summer, light intensity is high, and nutrients accumulate in the surface waters; these help sustain algal growth. Thus Nodularia spumigena effectively acts as a biogenic agent in removal of nutrients from surface waters which settle to the lake bottom. Lake waters are aerated well enough that dissolved oxygen depletions do not occur in the bottom waters indicating biogenic activity within the lake is efficient and the eutrophic state of the lake is moderate. Nodularia spumigena does not have an extreme effect on the zooplankton of Pyramid Lake, except perhaps by inducing a physical crowding problem that inhibits zooplankton grazing in surface waters.
W76-08374

PREPARATION OF PLANS AND SPECIFICATIONS FOR POLLUTION ABATEMENT ACTIVITIES IN CHERRY CREEK WATERSHED, MARYLAND.
Skelly and Loy, Harrisburg, Pa.; and Zollman Associates, Inc., Baltimore, Md.
For primary bibliographic entry see Field 5G.
W76-08385

DEVELOPMENT OF AN OVERALL ECONOMIC/ENVIRONMENTAL PLAN FOR THE MONONGAHELA RIVER BASIN.
Gibbs and Hill, Inc., New York.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 790 $8.50 in paper copy, $2.25 in microfiche. Prepared for the Appalachian Regional Commission, Washington, D.C., September 1974. 244 p, 10 fig, 36 tab, 6 append. EPA 14010-HQC-3.

Descriptors: *Acid mine water, *Mine water, Waste water(Pollution), Water pollution sources, *Land use, *Mine drainage, *Coal mine wastes, *Strip mine wastes, Abatement, *Water pollution control, *Air pollution, *Pollution abatement, *Appalachian Mountain Region, Mine acids, Water pollution, Pennsylvania, Maryland, West Virginia, Economic impact, Cost-benefit analysis, *Engineer estimates, *Alternative planning.
Identifiers: *Monongahela River Basin, Vehicular emissions.

Specific problem areas discussed are: (1) water pollution-mine drainage, sewage treatment, industrial waste, siltation, urban runoff; (2) air pollution-coal mine refuse seam fires, power plants and processing plants, heating loads, vehicular emissions; (3) land problems-mine refuse piles, subsidence, unreclaimed strip mines, junk cars, residential refuse dumps. Seventy-seven zones are rated by procedures developed by Rivkin/Carson, with Arthur Edwards Associates. Environmental improvement cost estimates for each zone are tabulated. Water pollution abatement is considered the most pressing need. Mine drainage pollution affects 22% of the 11,084 miles of the river, affecting all but minor areas of the basin. Inactive or abandoned mines cause most of this problem. Some progress has been made in abatement of pollution from active mines. An alternative order of priorities ranks only those zones with abandoned mine sites discharging at least 1,180 lbs/day of acid. Treatment of 154 of these sites would cost an estimated $5.8 million yearly for operation and maintenance and would not reduce the sulfate content of treated discharge. Zones furthest from the basin mouth are assigned highest priority since these affect the most stream miles. Increased local and federal funding is needed to complete secondary treatment facilities for some communities. EPA and the states have started to tackle the industrial waste pollution control problem. Enforcement of existing regulations and new legislation can aid in solving problems of erosion and siltation. Data is not now available for assessing the magnitude of problems of urban runoff and overflows. (Hufschmidt - North Carolina)
W76-08387

ROLE OF VITAMINS IN BACTERIAL-PLANKTON RELATIONSHIPS IN LITTORAL SEAWATER AND IN SUPRALITTORAL POOLS: II. ANNUAL EVOLUTION OF ORGANISMS WHICH PRODUCE VITAMIN SYNTHESIS, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
E. Vaceloet.
Cah Biol Mar. 16, p 383-394, 1975.

Descriptors: *Vitamins, *Microorganisms, *Bacteria, *Fungi, *Yeasts, Seasonal, Seawater, Inland waterways, Littoral, *Plankton, Growth rates, Populations, Aquatic populations.
Identifiers: Supralittoral pools, Rockpools.

Occurrence of vitamin-synthesizing organisms bacteria, fungi and yeasts in supralittoral rockpools and inshore waters was investigated. The seasonal changes of bacteria releasing vitamins are highly related to the heterotrophic microflora as a whole and especially to variations in the activity index of bacteria (i.e., to the growth rate of bacterial population). The annual changes of fungi and yeasts are, in part, opposite of those of the bacteria, but bacteria, fungi and yeasts seem to be enhanced by high temperatures and strong concentrations of organic matter.--Copyright 1976, Biological Abstracts, Inc.
W76-08405

CULTURE AND GROWTH OF NORTHERN ANCHOVY, ENGRAULIS MORDAX LARVAE,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
For primary bibliographic entry see Field 2L.
W76-08432

WEIGHT LOSS, MORTALITY, FEEDING, AND DURATION OF RESIDENCE OF ADULT AMERICAN SHAD, ALOSA SAPIDISSIMA IN FRESH WATER,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
M. E. Chittenden, Jr.
Fishery Bulletin, Vol. 74, No. 1, p 151-157, 1976. 1 fig, 41 ref.

Descriptors: *Freshwater fish, Weight, *Mortality, *Spawning, *Anadromous fish, *Commercial fish, Sport fish, Fish migration, Fish behavior, Reproduction, Fish reproduction, Size, Dimensions, Analytical techniques, Regression analysis, Food, Habits, Metabolism.
Identifiers: Alosa sapidissima, *American shad, Feeding behavior.

Linear regression equations are given for each sex for the regressions of total weight, somatic weight, and gonad weight on length prior to spawning, and for total weight on length after prolonged stay in fresh water. Most shad began to return seaward by late June and probably had spent a maximum of about 2 months in fresh water. Many fish, however, remained near the spawning grounds well into summer, and many died near the spawning grounds, probably from starvation. Opportunistic feeding occurred on 'planktonic' items, but adult shad do not regularly obtain energy sufficient to maintain their weight in fresh water. Weight loss was related to sex and increased with increasing size. Mean length males and females averaged 45 and 57% total weight loss, respectively. Daily somatic weight loss was at least 5.75 g for males of average size and 12.47 g for females. (Katz)
W76-08433

CHLORINATED HYDROCARBONS IN MESOPELAGIC FISHES OF THE EASTERN GULF OF MEXICO,
University of South Florida, St. Petersburg, Fla.
R. C. Baird, N. P. Thompson, T. L. Hopkins, and W. R. Weiss.
Bulletin of Marine Science, Vol. 25, No. 4, p 473-481, 1975. 2 tab, 41 ref.

Descriptors: Chlorinated hydrocarbon pesticides, *Absorption, *DDT, *Pesticide residues, *Polychlorinated biphenyls, *Dieldrin, *Gulf of Mexico, Zooplankton, Path of Pollutants, *Food webs, Fish, Deep water, Pesticides, Organic pesticides, Methodology, DDE, DDD, Chemical analysis.
Identifiers: Bioaccumulation, *Mesopelagic fishes, Deep water fishes, *Myctophidae, Gonostoma sp., Cyclothone sp.

Selected zooplankton collections and 1052 individuals representing 17 species of mesopelagic fishes from the eastern and northern Gulf of Mexico were analyzed for concentrations of DDT and its metabolites, dieldrin, and polychlorinated biphenyls (PCB's). DDT and its metabolites were found in small but measurable concentrations (generally less than 0.01 ppm) in all but a few samples. Dieldrin occurred more sporadically but when found, was generally in somewhat higher concentrations than DDT and metabolites. PCB's were ubiquitous and concentrations were usually one to two orders of magnitude higher than measured pesticide residues. PCB concentrations were as high or higher than that reported from midwater fishes from other areas, and measured organochlorine 'loads' were generally less than 1 ppm. No consistent geographic pattern was apparent. Diets varied considerably among species of fish as did organochlorine concentrations, although copepods were usually the principal forage. Nonmigrating species living at considerable depth appeared to concentrate organochlorines comparable to those which undergo diel vertical migration. The data tentatively suggest that dietary intake is an important organochlorine source for mesopelagic fishes and further imply a flow of energy out of the euphotic zone via oceanic food webs involving vertically migrating organisms. (Katz)
W76-08434

ABUNDANCE OF MACROCRUSTACEANS IN A NATURAL MARSH AND A MARSH ALTERED BY DREDGING, BULKHEADING, AND FILLING,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
L. Trent, E. J. Pullen, and R. Proctor.
Fishery Bulletin, Vol. 74, No. 1, p 195-200, 1976. 3 tab, 2 fig, 16 ref.

Descriptors: Landfills, Bulkheads, *Marshes, *Eutrophication, Canals, Aquatic populations, *Crustaceans, Invertebrates, *Pink shrimp, Distribution, *Diurnal distribution, Diurnal, Construction, *Dissolved oxygen, Shrimp, Crabs, Migration, Aquatic habitats, Shallow water, Bodies of water, Distribution patterns, Environmental effects, Land reclamation, Land develop-

ment, Food webs, Seasonal, Estuaries, Water pollution effects.
Identifiers: *Brown shrimp, *White shrimp, Penaeus spp., Callinectes spp., *Blue crab.

Indices of abundance of macrocrustaceans were determined for day and night and statistically compared between a natural marsh area, upland and bayward canal areas of a housing development, and an open bay area. Differences were found in day-night distribution of brown shrimp (Penaeus aztecus), white shrimp (P. setiferus), blue crabs (Callinectes sapidus) and pink shrimp (P. duorarum). Migrations of all four species into the more shallow marsh areas at night explain these distributional differences. The generally lower catches of each species in the open bay and upland canal areas when compared with the marsh and bayward canal areas were attributed to permanent loss of intertidal vegetation in the housing development, low abundance of detrital material and benthic macroinvertebrates in the open bay and upland canal areas, and eutropic conditions in the upland canal area. (Katz)
W76-08435

DDT AND ITS METABOLITES IN THE SEDIMENTS OFF SOUTHERN CALIFORNIA,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
J. S. MacGregor.
Fishery Bulletin, Vol. 74, No. 1, p. 27-35, 1976. 8 fig., 4 tab., 6 ref.

Descriptors: *Sewage effluents, *DDT, *DDE, *DDD, *Chlorinated hydrocarbon pesticides, Water pollution sources, *Industrial wastes, *Metabolism, *Bottom sediments, *California, *Path of pollutants, Sampling, Pesticides, Aroclor, Chemical analysis, Bottom sampling, Water pollution effects, Methodology, Analytical techniques.
Identifiers: *Los Angeles County(Calif).

To asses the degree of DDT contamination in the marine sediments off Los Angeles, 103 stations in the Pacific Ocean off southern California were sampled in July and August 1971 for DDT and its metabolites, DDD and DDE. Heavy contamination of bottom sediments in this area was expected because of large amounts of DDT that have entered the ocean through the Los Angeles County sewer system as waste from a DDT manufacturing plant. From the data acquired, it was estimated that there were about 200 metric tons of DDT, DDD, and DDE in the sediments in an area of 14 square nautical miles near the sewer outfalls and 300 metric tons in the entire 911 square nautical mile area sampled. The heaviest concentrations of total DDT were distributed in the relatively shallow-water area on the Palos Verdes shelf to the northwest of the sewer outfalls in the general direction of the current flow. Metabolism of DDT was inhibited in deep-water sediments. Ratios of DDE to DDT were low, and DDT was more abundant than DDE at some stations. In sediments from shallow-water stations, DDE exceeded DDT by more than 10 times. (Katz)
W76-08436

EFFECTS OF TEMPERATURE AND SALINITY ON THE SURVIVAL OF WINTER FLOUNDER EMBRYOS,
National Marine Fisheries Service, Narragansett, R. I. Narragansett Lab.
C. A. Rogers.
Fishery Bulletin, Vol. 74, No. 1, p. 52-58, 1976. 4 fig., 6 tab., 20 ref.

Descriptors: *Fish reproduction, *Embryonic growth stage, *Fish eggs, *Temperature, *Salinity, Laboratory tests, Hatching, *Commercial fish, Sport fish, *Larval growth, Growth stages, Resistance, Pathology, Mortality, Osmosis, Spawning, Environmental effects, Water pollution effects.
Identifiers: Pseudopleuronectes americanus, *Winter flounder.

A series of experiments was performed to determine the optimum temperature and salinity for incubating winter flounder, Pseudopleuronectes americanus, embryos. Eggs in lots of 50 were subjected to a 0.5 to 45 ppt salinity range and a 3 to 14C temperature range in a total of 67 salinity-temperature combinations. Highest proportion of viable hatches occurred at 3C over a salinity range of 15 to 35 ppt. At temperatures above 3C, the optimal range was 15 to 25 ppt. Viable hatch decreased with increasing temperature. (Katz)
W76-08437

ELECTROPHYSIOLOGICAL STUDIES OF MORPHOLINE-IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH) AND RAINBOW TROUT (SALMO GAIRDNERI),
Wisconsin Univ., Madison. Lab. of Limnology.
J. C. Cooper, and A. D. Hasler.
Journal of the Fisheries Research Board of Canada. Vol. 33, p. 688-694, 1976. 1 fig., 2 tab., 17 ref.

Descriptors: Salmonids, *Rainbow trout, Anadromous fish, Fish behavior, Analytical techniques, Odor, Fish physiology, *Spawning, *Fish migration, Laboratory tests, *Lake Michigan, Bioassay, Fish reproduction, Life cycles, Smolt, Water pollution effects, Lakes.
Identifiers: *Electroencephalography, *Salmonid homing, *Coho Salmon, Imprintation, Olfactory hypothesis, Electrophysiology, Morpholine, Oncorhynchus Kisutch, Salmo gairdneri.

Two groups of coho salmon were exposed to a 5 x 10-5 mg/l concentration of a synthetic chemical, morpholine, for 4 weeks during the smolting period while two control groups were unexposed. All groups were marked and stocked into Lake Michigan. A second group of exposed and unexposed salmon was released 13 km from the first release location. Rainbow trout were tested in a similar experiment. Homing salmonids were censused and then used in physiological experiments. Electroencephalographic studies showed significantly greater responses by the exposed compared to control fish to 1% morpholine and by one paired group to a stream sample scented with morpholine (about 10-3 mg/liter). Responses to morpholine were specific in that another similar chemical did not elicit responses. These data support the olfactory hypothesis that salmon may imprint to naturally occurring homestream odors as they do to morpholine. (Katz)
W76-08438

EXPERIMENTAL CONFIRMATION OF THE OLFACTORY HYPOTHESIS WITH HOMING, ARTIFICIALLY IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH),
Wisconsin Univ., Madison. Lab. of Limnology.
J. C. Cooper, A. T. Scholtz, R. M. Horrall, A. D. Hasler, and D. M. Madison.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 703-710, 1976. 2 fig., 3 tab., 27 ref.

Descriptors: *Spawning, *Fish migration, Fish behavior, *Salmonids, Odor, *Smolt, On-site investigations, On-site data collections, Fish reproduction, Anadromous fish, Life cycles, *Lake Michigan, Fish reproduction, Analytical techniques, Lakes, Water pollution effects.
Identifiers: *Olfactory hypothesis, *Coho salmon, Oncorhynchus kisutch, Imprintation, Morpholine.

To test the olfactory hypothesis of salmon homing, fingerling coho salmon were exposed to low concentrations of an odorous synthetic chemical, morpholine, during presmolt and smolting periods. The exposed fish were stocked into Lake Michigan with a control group. Another group of exposed and unexposed fish was released 13 km from the first group. During the adult spawning migration 18 months later, morpholine was dripped into the creek at the site of the first group release. In four experiments over 2 consecutive years the number of exposed fish captured at the artificially scented stream exceeded the number of unexposed fish by about 10 times, representing a highly significant difference. During the third year, morpholine was not added to the stream during the spawning migration and exposed and nonexposed fish returned in equal, low numbers. These results confirm the existence of odor imprinting and long-term olfactory memory in coho salmon. It is possible that this mechanism is also used in the natural imprinting situation. (Katz)
W76-08439

EFFECTS OF LOW CONCENTRATIONS OF OIL ACCOMMODATED IN SEA WATER ON THE GROWTH OF UNIALGAL MARINE PHYTOPLANKTON CULTURES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
N. J. Prouse, D. C. Bordon, Jr., and P. D. Keizer.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 810-818, 1976. 4 fig, 5 tab, 22 ref.

Descriptors: Oil, *Phytoplankton, *Growth rates, Sea water, *Water pollution effects, *Oil pollution, *Plant growth, *Algae, Marine microorganisms, Water pollution sources, Environmental effects, Laboratory tests, Inhibition, Primary productivity, Oil spills, Oily water, Analytical techniques, Gas chromatography, Spectroscopy.
Identifiers: *Growth stimulation.

Effects of three oils accommodated in sea water upon the growth of unialgal cultures of marine phytoplankton were investigated. The oil concentrations used covered the range normally encountered in sea water subjected to oil pollution (less than 1 mg/liter). In most experiments, minor stimulation or inhibition of growth occurred but in only two experiments was the growth of oil-contaminated cultures statistically different from controls (in both instances stimulation). Extrapolation of the results to the natural environment is complicated by several factors, the most important of which appear to be variability in organism response and the observation that oil concentration and composition change during experiments. Oil concentrations encountered in polluted sea water can affect the growth of phytoplankton, but the effects seem to be minor and short-lived. (Katz)
W76-08440

NOTE ON THE DISTRIBUTION OF MERCURY IN FISH SPECIES IN THREE OHIO LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
J. L. Aronson, M. Spiesman, and A. K. Aronson.
Environmental Pollution, Vol. 10, p. 1-7, 1976. 3 fig., 9 ref.

Descriptors: *Mercury, Fish, *Path of pollutants, *Food webs, *Carp, *Bioindicators, Metals, Water pollution effects, Sunfishes, Perches, Catfish, White Bass, Sediment, Adsorption, Lake Erie, *Ohio, Lakes, Distribution.
Identifiers: Pymatuning Lake(Ohio), Mosquito Lake(Ohio), Tissue analysis.

Mercury was measured for over a hundred fish (sunfish, perch, catfish, white bass and carp) from Fairport Harbour in Lake Erie and from Pymatuning Lake and Mosquito Lake, two large non-industrialized lakes near Lake Erie. All the taxa in the two lakes except carp contain the same low content of mercury, about 0.1 ppm. Carp are distinctly higher at about 0.25 ppm. At Fairport Harbour, carp also contain about 0.25 ppm mercury but, in contrast with the other two lakes this is not higher than the mercury of the other species, which also contain 0.25-0.35 ppm mercury. (Katz)
W76-08441

CHANGES IN BLOOD CHEMISTRY AND BLOOD CELL MORPHOLOGY IN COHO SALMON (ONCORHYNCHUS KISUTCH) FOLLOWING EXPOSURE TO SUBLETHAL LEVELS OF TOTAL RESIDUAL CHLORINE IN MUNICIPAL WASTEWATER,
Municipality of Metropolitan Seattle, Wash. Water Quality Lab.
J. A. Buckley, C. M. Whitmore, and R. I. Matsuda.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 776-782, 1976. 5 fig., 3 tab., 24 ref.

Descriptors: *Municipal wastes, *Chlorination, *Salmon, *Bioassay, *Pesticide residues, Fish physiology, Environmental effects, Chemical analysis, *Fish diseases, Water treatment, Chlorine, Sewage treatment, Salmonids, Waste water treatment, Laboratory tests, Toxicity, Toxicants, Water pollution sources, Water pollution effects.
Identifiers: *Sublethal effects, Oncorhynchus kisutch, *Blood chemistry, Erythrocytes, Anemia, Hemoglobin, *Coho salmon.

Yearling coho salmon were exposed for 12 weeks to either 0.3, 1.1 or 3.6% chlorinated municipal sewage treatment plant effluent with seawater diluent under continuous flow conditions. The maximum safe concentration of effluent lies between 0.3 and 1.1% (average total residual chlorine (TRC12) content 0.003 and 0.009 mg/liter respectively). Effluent concentrations of 0.3% produced no discernible effects on the fish. Concentrations of 1.1 and 3.6% (average content of TRC12 0.030 mg/liter) resulted in reductions of hemoglobin and hematocrit to levels indicative of anemia. Observations of the erythrocytes revealed lysed and degenerating cells, increased numbers of circulating immature cells, and abnormal cells. These hematological effects are attributed to the oxidative nature of the residual chlorine. (Katz)
W76-08442

SALINITY EFFECTS ON PLASMA ELECTROLYTES OF CHANNEL CATFISH, ICTALURUS PUNCTATUS,
Memphis State Univ., Tenn. Dept. of Biology; and Memphis State Univ., Tenn. Ecological Research Center.
K. B. Davis, and B. A. Simco.
Journal of the Fisheries Research Board of Canada, Vol. 33, pp. 741-746, 1976. 3 fig., 1 tab., 40 ref.

Descriptors: Salinity, *Channel catfish, Fish physiology, *Electrolytes, *Seasonal, *Temperature, Laboratory tests, Brackish water fish, Saline water, Sodium, Sodium chloride, Chlorides, Catfish, Freshwater fish, Osmosis, Water pollution effects.
Identifiers: *Plasma electrolytes, *Cortisol, Sublethal effects, *Salinity effects.

Plasma sodium and chloride levels of channel catfish increased after a 5-day exposure to 10 and 12 g/liter sodium chloride. Exposure of fish to 4 and 8 g/liter for 5 days resulted in plasma electrolyte levels higher than those of fish kept in aged tap water, but were not different from values usually found in freshwater fish. These differences may have been due to the handling. No seasonal effects were observed. When fish in July (27 C) were exposed to 10 g/liter sodium chloride, the plasma electrolyte concentration increased for 48 hours and then stabilized. Exposure to the same concentration in March (9 C) resulted in a slow increase of plasma electrolytes throughout the 13 days of the experiment. Injection of 100 micrograms/kg cortisol had no effect on plasma electrolyte increase during 48 hours after transfer to 12 g/liter sodium chloride. (Katz)
W76-08443

MORTALITIES AND EPIBIOTIC FOULING OF EGGS FROM WILD POPULATIONS OF THE DUNGENESS CRAB, CANCER MAGISTER,
California Univ., Davis. Dept. of Food Science and Technology.
W. S. Fisher, and D. E. Wickham.
Fishery Bulletin, Vol. 74, No. 1, p. 201-206, 1976 6 fig., 28 ref.

Descriptors: *Mortality, *Commercial shellfish, Fouling, *Crabs, *Hatching, *Immature growth stage, Aquatic algae, Nuisance algae, Cyanophyta, Crustaceans, Invertebrates, Sampling, Microscopy, Bays, *California, Shellfish farming, Water pollution effects.
Identifiers: Cancer magister, *Epibiotic fouling, *San Francisco Bay, *Crab eggs.

Observations of fouling and mortality in the natural population of Dungeness Crab, Cancer magister, suggested an explanation for the decline in Dungeness crab catches from the San Francisco Bay region. A distributional study compared mortalities and epibiotic fouling of crab eggs from various locations along the coast of Northern California. Epibiotic fouling organisms were found to be long filamentous cyanophytes and bacterial filaments. Worms were found, too. A relationship between fouling and egg mortality was tentatively established. Other factors contributing to the decline in the crab population in the San Francisco area are shifting currents, rainfall, and upwelling intensity. Since the fouling organisms are saprophytic, external factors causing epibiotic fouling may originate in San Francisco Bay effluent. (Katz)
W76-08444

OPTICAL MALFORMATIONS INDUCED BY INSECTICIDES IN EMBRYOS OF THE ATLANTIC SILVERSIDES, MENIDIA MENIDIA,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Zoology; and Rutgers - The State Univ., New Brunswick, N. J. Dept. of Physiology.
J. S. Weiss, and P. Weiss.
Fishery Bulletin, Vol. 74, No. 1, p. 208-211, 1976. 1 tab., 1 fig., 17 ref.

Descriptors: *Embryonic growth stage, *DDT, *Toxicants, *Fish diseases, *Toxicity, *Pesticides, Water pollution effects, Hatching, Fish eggs, *Silversides, Reproduction, Laboratory tests, Environmental effects, Mortality, *Fish reproduction, Insecticide, Chlorinated hydrocarbon pesticides, Insecticides.
Identifiers: *Sevin, *Malathion, *Menidia menidia.

Tests with DDT, malathion and sevin were performed to determine the effects of these pesticides on the development of Menidia menidia eggs in the laboratory. Eggs at a cleavage stage of about 100 cells, late cleavage, were treated with malathion of 10 and 100 ppb and sevin at 25 and 100 ppb. Percents of successful axis formation and heartbeat initiation were lower than controls, while hatching time was not affected. Eggs at the 2-4 cell stage were exposed to DDT at 25 and 100 ppb and to malathion at 10 and 100 ppb and similar results were found. Optic malformations were observed in embryos exposed to DDT, malathion and sevin. Skeletal malformations were also noted in some cases. (Katz)
W76-08445

THE PLANKTON TOWER. I. A STRUCTURE TO STUDY WATER/SEDIMENT INTERACTIONS IN ENCLOSED WATER COLUMNS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
B. Von Bodungen, K. Von Brockel, V. Smetacek, and B. Zeitschel.
Marine Biology, Vol. 34, p 369-372, 1976. 2 fig, 7 ref.

Descriptors: *Bottom sediments, *Analytical techniques, Structures, Technology, Equipment, Research equipment, *Sea water, Aquatic environment, Design, *Towers, Columns.
Identifiers: *Plankton tower, *Kiel Bight(Germany).

A brief description and schematic drawing is given of the plankton tower. It consists of a steel structure 16.5 m high, standing at a depth of 11 m. Four cylindrical plastic enclosures, each with a volume of about 30 cubic meters, are suspended in the tower. A column of water, from the surface to the bottom including sediments, is contained within each of these. Results from the first experiment show that this method is suitable for investigations concerned with the study of interactions between the water column and the sediments. (See also W76-08447) (Katz)
W76-08446

THE PLANKTON TOWER. II. RELEASE OF NUTRIENTS FROM SEDIMENTS DUE TO CHANGES IN THE DENSITY OF BOTTOM WATER,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
V. Smetacek, B. vonBodungen, K. vonBrockel, and B. Zeitschel.
Marine Biology, Vol. 34, p 373-378, 1976. 1 tab, 3 fig, 15 ref.

Descriptors: Density, Discharge(Water), On-site investigations, *Benthos, *Bottom sediments, *Salinity, *Nutrients, Connate water, Saline water, Pore water, Hypolimnion, Cycling nutrients, Water properties, Dissolved oxygen, Interstices, Sediments.
Identifiers: *Plankton tower, Nutrient discharge.

A water column of about 30 cubic meters extending from the surface to the bottom over a 3 square meter patch of sediment (coarse sand), was isolated and observed over a period of 33 days. Water exchange took place with the surroundings because of near-surface openings that appeared in the enclosure, and also because of density changes due to salinity fluctuations in the surrounding water. Denser water entered the enclosure through the sediments, displacing the lighter water through the near-surface openings. Very high nutrient and low oxygen values were measured in the bottom water following this water influx. It is postulated that interstitial water is flushed out of coarse-grained sediments by gravity displacement due to changes in the density of bottom water. In certain areas this mechanism of nutrient release from the sediments is presumably of great ecological importance for the phytoplankton and benthos. (See also W76-08446) (Katz)
W76-08447

THE TOXICITY OF VARIOUS MINING FLOTATION REAGENTS TO RAINBOW TROUT (SALMO GAIRDNERI),
Sir George Williams Univ., Montreal (Quebec). Dept. of Biological Sciences; and Sir George Williams Univ., Montreal (Quebec). Water Pollution Research Lab.
M. Webb, H. Ruber, and G. Leduc.
Water Research, Vol. 10, p 303-306, 1976. 3 tab, 4 ref.

Descriptors: *Bioassay, *Rainbow trout, *Mine wastes, *Flotation, *Froth flotation, *Toxicity, *Lethal limit, Laboratory tests, Water treatment, Methodology, Water pollution sources, Toxicants, Water quality control, Water pollution effects, Bioindicators.
Identifiers: Flow-through bioassay, Static bioassay, Frothers, *Xanthates, Flotation reagents, Potassium ethyl xanthate, Sodium isopropyl xanthate, Sodium ethyl xanthate, Potassium amyl xanthate, Xylenol, Polypropylene glycol.

Preliminary testing of eight collectors (xanthates) and four frothers in 96-h static and 28-day flow-through bioassays using rainbow trout as the test organism show a great disparity in the toxicity of the chemicals administered in these two ways. For the short-term tests, the relative toxicity of the compounds is expressed as an LC-50 or as a range of concentrations in mg/l in which the LC-50 is expected to fall. Sodium ethyl and potassium amyl xanthate were the most toxic collectors tested in this way with LC-50's in the range of 30-50 mg/l. Among the frothers, xylenol (cresylic acid) was the most toxic (5.6 mg/l greater than LC-50 greater than 3.2 mg/l) while polypropylene glycol was least toxic (LC-50 greater than 1000 mg/l). In long-term flow-through tests using potassium ethyl, sodium isopropyl, sodium ethyl, and potassium amyl xanthate, the toxicity of the chemicals was on the order of 100 times greater than in the static bioassay results. (Katz)
W76-08448

PASSAGE OF METALS IN EFFLUENTS, THROUGH BACTERIA TO HIGHER ORGANISMS,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-08449

THE ACUTE TOXICITY OF DISSOLVED ELEMENTAL PHOSPHORUS TO COD (GADUS MORHUA),
Imperial Chemical Industries Ltd., Bixham (England). Brixham Research Lab.
B. G. Maddock, and D. Taylor.
Water Research, Vol. 10, p 289-294, 1976. 3 fig, 2 tab, 12 ref.

Descriptors: Aqueous solutions, *Toxicity, Laboratory equipment, *Lethal limit, Laboratory tests, *Phosphorus, Analytical techniques, *Bioassay, *Absorption, Water quality, *Toxicants, Gas chromatography, Methodology, Water pollution effects.
Identifiers: Gadus morhua, *Cod, Bioaccumulation, Tissue analysis.

The effect of elemental phosphorus in true solution on cod (Gadus morhua) was tested in a laboratory experiment designed to eliminate the influence of a colloidal suspension. The 48 hr LC 50 for dissolved elemental phosphorus is 14.4 micrograms per liter. The incipient lethal level is estimated at 1-2 micrograms per liter. Elemental phosphorus was rapidly assimilated into the body tissues with a homogeneous distribution of phosphorus in the muscle tissue at 10-30 times the exposure level. Livers contained the highest concentrations of phosphorus. When exposure is ended, the biological half-life of accumulated phosphorus appears to be very short. (Katz)
W76-08450

THE EFFECT OF HEAVY METALS ON LABORATORY POPULATIONS OF TWO POLYCHAETES WITH COMPARISONS TO THE WATER QUALITY CONDITIONS AND STANDARDS IN SOUTHERN CALIFORNIA MARINE WATERS,
California State Univ., Long Beach.
D. J. Reish, J. M. Martin, F. M. Piltz, and J. Q. Word.
Water Research, Vol. 10, p 299-302, 1976. 3 tab, 12 ref.

Descriptors: *Bioassay, *Heavy metals, Water quality, *Toxicity, Water pollution sources, Water pollution effects, *Lethal limit, Laboratory tests, *Annelids, Larvae, Cadmium, Copper, Lead, Mercury, Zinc, Chromium, Municipal wastes, Sewage effluents, *Growth stages, Water quality standards, Benthic fauna, Environmental effect, Water quality control.
Identifiers: *Neanthes sp., *Capitella sp., Polychaetes.

Polychaetous annelid assays were performed with laboratory inbred cultures of juvenile an adult Neanthes arenaceodentata an Capitella capitata to cadmium, chromium, copper, lead, mercury, and zinc in sea water. Data werepresented as 96-h and 28-day LC-50 concentrations. Mercury and copper were the two most toxic with zinc and chromium generally the next most toxic followed by lead and cadmium. The adult stages of both species were more tolerant to these metals than the juveniles. Comparisons of these six metals present in the two large domestic sewage outfalls in Los Angeles County indicate that the amount of copper and zinc present in the effluent exceeds the 28-day LC-50 of these two polychaetes. The results were compared to the water quality standards for discharges in the State of California. (Katz)
W76-08451

UPTAKE AND ACCUMULATION OF COPPER AND NICKEL BY METAL TOLERANT STRAINS OF SCENEDESMUS,
P. Stokes.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2128-2137, 1975, 6 tab, 4 fig, 13 ref.

Descriptors: Copper, Nickel, *Algae, Plant populations, Plant physiology, *Mine wastes, Mining, *Scenedesmus, Plant growth regulators, Water quality control, Methodology, *Toxicity, Permeability, Canada, *Absorption, Water pollution effects.
Identifiers: *Sudbury(Ontario), *Bio-accumulation, *Copper uptake rate, *Nickel uptake rate, Prolonged uptake.

The toxicity of copper and nickel to algae isolated from a lake in mining-smelting areas of Sudbury, Ontario, are tested in the laboratory. Copper and nickel are taken up by the algae. The uptake and toxicity of nickel in the presence of copper supports the theory that copper increases the permeability of the cell. (Katz)
W76-08452

EFFECT OF CRUDE OIL ON POPULATIONS OF BACTERIA AND ALGAE IN ARTIFICIAL PONDS SUBJECT TO WINTER WEATHER AND ICE FORMATION,
D. B. Shindler, B. F. Scott, and D. B. Carlisle.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2138-2144, Stuttgart, November 1975. 2 tab, 6 fig, 12 ref.

Descriptors: *Oil pollution, Oil spills, *Algae, Aquatic microorganisms, *Azotobacter, Oil water interface, Water pollution effects, Environmental effects, Food web, Aquatic environment, Methodology, *Bacteria, Canada, *Oil wastes, Ponds, Eutrophication.
Identifiers: Normal wells crude oil, *Heterotrophic bacteria, Flavobacterium, Vibrio, Acinetobacter, Arthrobacter, Caulobacter.

Field and experimental studies in Ottawa, Canada, under winter ice conditions indicated that oil added to water greatly affected microorganisms present. After oil from a spill enters the lake waters an initial selection of one or a few bacterial types takes place, followed by a development of greater diversity. The initial bacteria are similar or closely related to types reported to degrade crude oil. Ponds remained aerobic the following summer and supported strictly aerobic bacteria such as Azobacter. Bacterial populations indicated an accelerated rate of eutrophication. (Katz)
W76-08453

HEAVY METAL TOXICITY AND SYNERGISM TO FLOATING AQUATIC WEEDS,
T. C. Hutchinson,, and H. Czyrska.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2102-2111, 1975. 3 fig, 8 tab, 6 ref.

Descriptors: Cadmium, Zinc, Silver, Copper, Nickel, *Phytotoxicity, Methodology, *Aquatic vegetation, Floating plants, *Heavy metals, *Absorption, Water pollution effects.
Identifiers: *Lemna minor, *Salvinia natans, Competitive effects, Cadmium-Zinc interaction, *Common duckweed, *Metal accumulation.

Lemna and Salvinia were grown in solutions of cadmium, zinc, silver, copper and nickel. A significant concentration effect was seen for all metals analyzed comparing water concentrations with plant levels. Data indicated the extent to which high metal accumulation can occur in duckweed and emphasize the potential hazards of increased metal discharges into water bodies. The magnification found for such toxic metals as copper, cadmium and lead was often greater than 1000 times, even at the low, non-toxic levels found in the lakes. (Katz)
W76-08454

DOES COPPER CAUSE ANEMIA IN BIOMPHALARIA GLABRATA,
Lehigh Univ., Bethlehem, Pa. Inst. for Pathology; and Lehigh Univ., Bethlehem, Pa. Center for Health Sciences.
T. C. Cheng.
Journal of Invertebrate Pathology, Vol. 26, p 421-422, 1975.

Descriptors: *Snails, *Gastropods, *Copper sulfate, *Toxicants, Copper, *Mode of action, *Pesticides, Laboratory tests, Analytical techniques, Molluscicides, Animal physiology, Water pollution effects.
Identifiers: *Biomphalaria glabrata, *Anemia.

To test the hypothesis that copper kills Biomphalaria glabrata by destroying the hemoglobin-synthesizing cells, snails were exposed to either 60 / 0.06 ppm CuS04 for 12 or 72 hours. Serum was analyzed for hemoglobin content and no significant differences were found between test animals and controls. The cidal effect of copper on this gastropod is as yet unknown. (Katz)
W76-08455

THE INFLUENCE OF WATER QUALITY ON ACCUMULATION OF HEAVY METALS IN AQUATIC ORGANISMS,
L. Karbe, N. Antonacopoulos, and C. Shnier.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie. Vol. 19, p 2094-2101, 1975. 6 fig, 10 ref.

Descriptors: Water quality, *Heavy metals, Mercury, Cobalt, Chromium, Zinc, *Molluscs, Pelycepods, Gastropods, *Dissolved oxygen, *Absorption, Water pollution effects, Trophic levels, Mussels.
Identifiers: Dreissena polymorpha, Unio tanidus, Anodonta anatina, Schaalser, Elbe River, Hamburg Harbor, *Saprobity.

Results of study support hypothesis that the accumulation of metals by organisms is strongly influenced by the trophic and saprobic condition of the water. Regional differences in mortality of organisms were observed. Studies demonstrate that water quality definitely influences heavy metal concentration by aquatic organisms. (Katz)
W76-08456

SURVIVAL RATE OF STARVING CARP (CYPRINUS CARPIO LINNE), (IN RUSSIAN),
Tsentralnyi Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Baku (USSR). Azerbaijan Branch.
T. A. Askerov.
Gidrobiol Zh. 11(1), p 102-103, 1975.

Descriptors: Fish, *Carp, *Fish hatcheries, *Mortality, Fishkill.

Identifiers: *Starvation(Fish).

In connection with the hatchery breeding of Cyprinus carpio the effect of starvation on the survival rate of larvae was investigated. The absence of food in the mixed (endogenous-exogenous) feeding stage delays resorption of the yolk and leads to underdevelopment of the digestive organs and to death on the 8-9th day after the start of mixed feeding.--Copyright 1976, Biological Abstracts, Inc.
W76-08552

PHYTOPLANKTON IN NORTHERN DONETSK PONDS FOR ADDITIONAL TREATMENT, (IN UKRANIAN),
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Inst. of Hydrobiology; and Dnepropetrovskii Gosudarstvennyi Universitet (USSR).
Z. S. Haukhman, A. S. Kyrylenko, and F. P. Ryabov.
Ukr Bot Zh. 32(1), p 100-102, 1975. (Engl. summ.).

Descriptors: *Ponds, *Phytoplankton, *Biomass, Chemical wastes, *Waste water treatment, Effluents.
Identifiers: Chlorophyceae, Diatomaceae, Donetsk, Euglenophyta, USSR.

Composition, numbers and phytoplankton biomass in ponds for additional waste treatment of chemical industry effluents in northern Donetsk (USSR) are discussed. As waste passed through the ponds the number of species, quantitative vegetation and total biomass of phytoplankton increased, the specific value of Diatomaceae decreased and that of Chlorophyceae and Euglenophyta rose, indicating a considerable role of the latter in the additional treatment process.--Copyright 1976, Biological Abstracts, Inc.
W76-08577

BACTERIAL CONTAMINATION OF PERENNIAL GRASSES IN OVERHEAD IRRIGATION WITH SEWAGE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Vilnius (USSR).
For primary bibliographic entry see Field 5D.
W76-08582

CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS, A SELECTED, ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Information Center.
J. S. Mattice, H. A. Pfuderer, and B. N. Collier.
Available from the National Technical Information Service, Springfield, Va 22161, as ORNL/EIS-82, $4.50 in paper copy, $2.25 in microfiche. ORNL/EIS-82, Environmental Sciences Division Publication No. 808, 69 p. March 1976. W-7405-eng-26.

Descriptors: *Bibliography, *Chlorine, *Aquatic environment, Chemistry, Environmental effects, Pollutant identification, Water pollution effects.

This bibliography contains 191 references which are arranged alphabetically by first author within the subject categories. Indexes provided are: author, keywords, scientific names of test organisms, geographic location of field research, and title. This is the first bibliography published from an information file on the chemistry and effects of chlorine in aquatic systems. Special efforts were made to record chlorine residuals, the systems in which the chlorine was assayed, methods of chlorine determination and physical conditions under which the experiments were run. (Chilton-ORNL)
W76-08592

SAVANNAH RIVER BIOLOGICAL SURVEY, LOWER THREE RUNS.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
Available from the National Technical Information Service, Springfield, Va 22161 as TID-26675, $4.50 in paper copy, $2.25 in microfiche. September-October 1962 for E. I. duPont de Nemours and Co., TID-26675, (1963), 58 p, 4 fig, 8 tab, append.

Descriptors: *Surveys, *Baseline studies, *Aquatic life, Environment, Populations, Insects, Algae, *South Carolina, Rivers, Pollutant identification.
Identifiers: Species diversity, *Savannah River(SC), Lower Three Runs.

The purpose of this survey conducted in September and October of 1962, was to determine whether any physical, chemical, or biological changes had occurred at the Millet-Martin Station on Lower Three Runs, a tributary of the Savannah River, since the last survey there in September, 1961. Evidence of damage was found to the insect fauna particularly in species diversity and population densities. An abundant food supply for the lower invertebrates indicated that the restrictions must have been due to some source other than food. A considerable increase in species diversity of protozoa indicated that some of the restricting influence may not now be acting. A 50% composite count for some algae indicated considerable organic enrichment. (Chilton-ORNL)
W76-08593

SAVANNAH RIVER BIOLOGICAL SURVEY.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
Available from the National Technical Information Service, Springfield, Va 22161, as TIP-26673, $7.75 in paper copy, $2.25 in microfiche. August-September 1955, May 1956 for E. I. duPont deNemours & Co., TID-26673, March, 1957. 210 p, 17 fig, 39 tab, 21 ref, 3 append.

Descriptors: *Surveys, *Baseline studies, *Aquatic life, Environment, Populations, *South Carolina, Pollutant identification.
Identifiers: *Savannah River(SC), Upper Three Runs.

Two series of studies were made in the vicinity of the Savannah River Plant for the purpose of determining whether or not any change had occurred in the aquatic life and general environmental factors in the Savannah River since the surveys of 1951-1952. The results of the studies indicate a considerable improvement in the aquatic life compared with the results of the summer survey of 1951 and the spring survey of 1952. The only group of organisms which seemed to be in poorer condition than at the time of the base line studies was the clams. Studies conducted on Upper Three Runs, a tributary of the Savannah River, indicated that the fauna and flora of the tributary were not in quite as good condition in 1955 as in 1951 with the change being most evident in the size of populations and to some extent in the number of species of algae, protozoa, and fish. However, in the spring of 1956 the fish were the only group showing a significant change. (Chilton-ORNL)
W76-08594

SAVANNAH RIVER LABORATORY ENVIRONMENTAL TRANSPORT AND EFFECTS RESEARCH ANNUAL REPORT - 1974.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W76-08596

TRANSURANIUM NUCLIDES IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
Available as STI/PUB/410 from UNI PUB, New York, N. Y. Proceedings of a sympoium held in San Francisco on November 17-21, 1975. IAEA, Vienna, Austria, 1976, 726 p.

Descriptors: *Conferences, *Radioisotopes, *Environmental effects, Publications, International commissions.

These proceedings include the full texts of 41 papers, the discussions on them and the panel presentations which were presented at the symposium. The symposium was sponsored by the United States Energy Research and Development Administration and the International Atomic Energy Agency. The subjects of the sessions include ecological studies; effluents and marine studies; geohydrologic studies; biological uptake and transfer; pathways to man; environmental monitoring; health effects, risks and standards; and evaluation of environmental materials. The subject of the panel discussion was Plutonium-Implications for Man and His Environment. (See W76-08598 thru W76-08607) (Chilton-ORNL)
W76-08597

STUDY OF THE BEHAVIOUR OF TRANSURANICS AND POSSIBLE CHEMICAL HOMOLOGUES IN LAKE MICHIGAN WATER AND BIOTA,
Argonne National Lab. Ill.
M. A. Wahlgren, J. J. Alberts, D. M. Nelson, and K. A. Orlandini.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held at San Francisco, November 17-21, 1975. p 9-24, 5 fig, 2 tab, 29 ref.

Descriptors: *Chemistry, *Plutonium, *Americium, *Uranium, Freshwater, Aquatic life, *Lake Michigan.

The mean concentration factors observed for Pu 239, 240, Am 241, and U 238 in Lake Michigan biota are presented and these values are compared to those of trace elements that have short residence times in Lake Michigan. Comparison of the concentraion factors indicates that the relative decreasing order of uptake of the three radionuclides in the freshwater food-chain is Am, Pu, and U. Evidence is presented that indicates a tetravalent oxidation state is likely as the dominant chemical form of fall-out plutonium in Lake Michigan. The time-dependence of the concentration of fall-out Pu 239, 240 in Lake Michigan can be described qualitively in terms of a simple mass-action model. (See also W76-08597) (Chilton-ORNL)
W76-08598

PLUTONIUM IN THE AQUATIC ENVIRONMENT, ITS BEHAVIOUR, DISTRIBUTION AND SIGNIFICANCE,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
K. C. Pillai, and E. Mathew.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 25-45, 12 tab, 1 fig, 25 ref.

Descriptors: *Environmental effects, *Plutonium, *Radioisotopes, *Aquatic environment, Sediments, Sea water, Benthos, Silts.
Identifiers: *Bombay Harbor Bay(India).

The behaviour and distribution of plutonium in seawater, silt, sediments, organisms and solar salt of Bombay Habour Bay were investigated. The suspended silts and bottom sediments were found to have a high capacity for removal of plutonium from seawater with nearly 99% of the plutonium being removed in this way. The maximum accumulation of Pu 239 was observed in benthic organ-

isms, particularly in arca flesh. The interaction of plutonium solutions and trace plutonium and the formation of both ionic and non-ionic species of plutonium were studied. Organic matter added to seawater inhibited hydrolysis and precipitation of added Pu. The anionic species increased with time. Plutonium was present in the purified organic fraction of material extracted from coastal sediments. (See also W76-08597) (Chilton-ORNL)
W76-08599

PLUTONIUM IN ATLANTIC COASTAL ESTUARIES IN THE SOUTHEASTERN UNITED STATES OF AMERICA,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
D. W. Hayes, J. H. LeRoy, and F. A. Cross.
In: Transuranium Nuclides in the Environment, Proceedins of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 79-88, 4 fig, 2 tab, 15 ref.

Descriptors: *Environmental effects, *Aquatic environment, *Plutonium, Estuaries, Nuclear powerplants, Atlantic Ocean, Southeast U.S.

Estuaries of the Savannah, Neuse, and Newport rivers and one tidal marsh were surveyed to determine the plutonium concentration in sediments, biota and suspended particulate matter. Of the three estuaries, only the Savannah River estuary has a nuclear installation upstream. The Savannah River estuary has received in addition to fall-out plutonium, up to 0.3 Ci of plutonium from the Savannah River Plant. In general, plutonium concentrations in the various environmental components of the Savannah River estuary were not higher than reported values for other coastal marine areas. (See also W76-08597) (Chilton-ORNL)
W76-08600

THE PLUTONIUM CONTENT OF PACIFIC OCEAN WATERS,
Geochemistry Research Association, Tokyo (Japan).
Y. Miyake, and Y. Sugimura.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 91-105, 4 fig, 8 tab, 23 ref.

Descriptors: *Plutonium, *Sea water, *Pacific Ocean, Surface waters, Deep water.

48 samples were collected across a wide area of the Pacific Ocean for the determination of the plutonium isotope contents and the Pu 238 to Pu 239, 240 isotopic ratio in the surface layer. In the North Pacific 0.00022 to 0.00094 pCi/l of Pu 239, 240 were observed in the surface waters. In the South Pacific the plutonium content ranged from 0.00013 to 0.00034 pCi/l. The ratio of Pu 238/Pu239, 240 in surface waters ranged from 0.1 to 0.81 in the North Pacific and 0.35 to 2.4 in the South Pacific. Higher ratios were observed in the deeper layer. (See also W76-08597) (Chilton-ORNL)
W76-08601

DISTRIBUTIONS OF TRANSURANIUM NUCLIDES IN SEDIMENT AND BIOTA OF THE NORTH ATLANTIC OCEAN,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-08602

COMPARISON OF THE DISTRIBUTIONS IN MARINE SEDIMENTS OF THE FALLOUT DERIVED NUCLIDES FE 55 AND PU 239,240, A NEW APPROACH TO THE CHEMISTRY OF ENVIRONMENTAL RADIONUCLIDES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-08603

ENVIRONMENTAL AND PUBLIC HEALTH CONSEQUENCES OF THE CONTROLLED DISPOSAL OF TRANSURANIC ELEMENTS TO THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. A. Hetherington, D. F. Jefferies, N. T. Mitchell, R. J. Penteath, and D. S. Woodhead.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, november 17-21, 1975. p 139-154, 9 tab, 10 ref.

Descriptors: *Environmental effects, *Public health, *Sea water, Plutonium, Americium, Biota, Radioisotopes, Sediments.

The paper reviews the radiological significance of plutonium and americium discharges to the marine environment in terms of dose to man and to environmental resources. From the public health viewpoint there appears to be a substantial margin of safety within the present authorization and for the aquatic organism considered the hazard does not seem to be of any great significance. The major part of the plutonium and americium appears to be removed from the general water circulation soon after discharge and becomes associated with the sediment phase forming a reservoir of these nuclides. There has been no measurable remobilization of the radioactivity within stable sedimentary deposits over periods of up to 20 years. However, more should be learned about the bond between these nuclides and the sediments in order to demonstrate the total safety of these discharges over periods dictated by the half-life of Pu 239. (See also W76-08597) (Chilton-ORNL)
W76-08604

INTERACTION OF PLUTONIUM WITH COMPLEXING SUBSTANCES IN SOILS AND NATURAL WATERS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W76-08605

PLUTONIUM AND AMERICIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Ill.
D. N. Edington, J. J. Alberts, M. A. Wahlgren, J. Karttumen, and C. A. Reeve.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 493-516, 4 tab, 4 fig, 22 ref.

Descriptors: *Radioactivity, *Plutonium, *Americium, Sediments, *Lake Michigan, Sedimentation rates.

The vertical distribution of Pu 239, 240 and Cs 137 was determined in 15 sediment cores. These sediments showed a total deposition of Pu 239, 240 ranging from 0.02 to 0.43 pCi/sq cm and, in areas of high sedimentation, a maximum concentration corresponding to the maximum atmospheric input during 1963. Comparison of Pu 239, 240 and Cs 137 deposition indicated that these isotopes are being removed by the same mechanism, with greatest deposition in areas of highest sedimentation rates. The Pu 238/ Pu 239, 240 ratio in selected cores exhibited ratios in the range 0.03 to 0.04. The possible chemical mobility of Pu 239, 240 was determined by examination of grab samples. Most of the plutonium wasassociated with the hydrous oxides of iron and manganese. Less than 7% of the total Pu 239, 240 was associated with the sedimentary humic and fulvic acid fractions. Studies showed that Am 241 is being formed in situ and shows little or no preferential mobility over Pu 239, 240. (See also W76-08597) (Chilton-ORNL)
W76-08606

PLUTONIUM RADIONUCLIDES IN THE GROUNDWATERS AT ENEWETAK ATOLL,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W76-08607

DETERMINATION OF PLUTONIUM IN THE MARINE ENVIRONMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5A.
W76-08615

RADIORUTHENIUM IN COASTAL WATERS,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5A.
W76-08619

A REVIEW OF METHODS FOR THE DETERMINATION OF RADIOACTIVE AND STABLE ZIRCONIUM IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W76-08620

A REVIEW OF METHODS FOR THE DETERMINATION OF RADIOACTIVE AND STABLE SILVER IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W76-08621

A REVIEW OF METHODS FOR THE DETERMINATION OF IODINE-131 IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W76-08622

A RAPID METHOD FOR THE DETERMINATION OF RADIOIODINE IN SUSPENDED MATTER AND SEAWATER,
Central Lab. for Radiological Protection, Warsaw (Poland).
For primary bibliographic entry see Field 5A.
W76-08623

A METHOD FOR THE RAPID ENRICHMENT AND DETERMINATION OF SILVER-110M AND IODINE-131 FROM SEAWATER,
Deutsches Hydrographisches Institut, Hamburg (West Germany).
For primary bibliographic entry see Field 5A.
W76-08624

A STUDY OF THE STABILITY OF SOME RADIONUCLIDES IN SEAWATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W76-08625

INTERCALIBRATION OF METHODS FOR RADIONUCLIDE MEASUREMENTS ON A SEAWEED SAMPLE,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.

For primary bibliographic entry see Field 5A.
W76-08626

RADIOACTIVITY IN THE HYDROSPHERE RECENT TRENDS IN CZECH STUDIES,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W76-08627

ENTRAINMENT AND INTAKE SCREENING, PROCEEDINGS OF THE SECOND ENTRAINMENT AND INTAKE SCREENING WORKSHOP.
Electric Power Research Inst., Palo Alto, Calif.
For primary bibliographic entry see Field 8I.
W76-08628

EVALUATION OF ENTRAINMENT EFFECT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 8I.
W76-08629

ZOOPLANKTON SURVIVAL IN COOLING WATER SYSTEMS OF FOUR THERMAL POWER PLANTS ON THE CALIFORNIA COAST-INTERIM REPORT. MARCH 1971-JANUARY 1972,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
J. W. Icanberry, and J. R. Adams.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University in Baltimore, Maryland, February 5-9, 1973. p 13-22, 11 tab, 5 fig, 8 ref.

Descriptors: *Cooling water, *Zooplankton, *Mortality, Entrainment, California, Nuclear powerplants.
Identifiers: Humboldt Bay Power Plant, Moss Landing Power Plant, Morro Bay Power Plant, Potrero Po Power Plant.

A definite linear relationship was found to exist between the discharge temperature and percentage of mortality difference as shown by regression analysis. The average mortality difference for Humboldt Bay Power Plant was 5.89%; for Moss Landing Power Plant, 10.68%; for Morro Bay Power Plant, 6.74%; for Potrero Power Plant, 1.31%. A filter-pump system was responsible for reducing intake and discharge sampling mortalities, thus providing a more accurate estimate of zooplankton mortality after passage through power plant cooling water systems. The adult copepod group was most abundant in the samples and experienced the highest overall mortality with soft-bodied forms being least abundant and incurring the lowest mortality. (See also W76-08628) (Chilton-ORNL)
W76-08630

ENTRAINMENT AND THERMAL EFFECTS ON A MYSID SHRIMP AND STRIPED BASS IN THE SACRAMENTO-SAN JOAQUIN DELTA,
California State Dept. of Fish and Game, Stockton. Delta Fish and Wildlife Study.
H. K. Chadwick.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, on February 5-9, 1973. p 23-30, 9 fig, 5 tab, 9 ref.

Descriptors: *Thermal pollution, *Environmental effects, Striped bass, Shrimp, Thermal stress, Entrainment, Nuclear powerplants.
Identifiers: Neomysis.

The report evaluates the effect of thermal discharges in terms of short-term temperature shock and long-term exposure to elevated temperatures on the species studied. In the thermal shock studies plant operations were simulated. Organisms coming into the plant were exposed to maximum temperatures (a maximum temperature rise of 10 degrees C at full plant capacity) for about 5 min. after reaching the condensers and then to a rapid decay to ambient temperatures after about 30 min in the river. The chief requirement for minimizing losses of striped bass and Neomysis appeared to be keeping the maximum temperature below 30 degrees C. It was generally concluded that striped bass passing through or near power plants have an exposure of something on the order of 30 min maximum and that the principal concern is with exposure to thermal shock and not to long-term exposure to elevated temperatures. (See also W76-08628) (Chilton-ORNL)
W76-08631

SUMMARY OF ENTRAINMENT RESEARCH AT THE MILLSTONE POINT NUCLEAR POWER STATION, 1970 TO 1972,
Woods Hole Oceanographic Institution, Mass.
E. J. Carpenter, B. B. Peck, and S. J. Anderson.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 31-35, 3 fig, 1 tab, 20 ref.

Descriptors: *Entrainment, *Thermal pollution, Mortality, Phytoplankton, Copepods, Primary productivity, Chlorination.

The effects of power plant entrainment on copepods and phytoplankton was studied. About 70% of the copepods entering the power plant were not returned to Long Island Sound. This represents a loss of about 0.1 to 0.2% of the secondary productivity over a 333 square km area of the Sound. It was shown that copepod mortality was affected primarily by the mechanical or hydraulic stresses of entrainment. Warming due to entrainment usually increased phytoplankton productivity by 5 to 25% in the cooler months and decreased by 60 to 95% in warmer months. Chlorination decreased primary productivity by about 80% even at low concentrations. (See also W76-08628) (Chilton-ORNL)
W76-08632

ENTRAINMENT STUDIES ON HUDSON RIVER ORGANISMS,
New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.
G. J. Lauer, W. T. Waller, D. W. Bath, W. Meeks, and R. Heffner.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 37-82, 22 tab, 40 fig, 40 ref.

Descriptors: *Entrainment, *Thermal stress, *Chlorination, Plankton, Fish eggs, Larvae, Growth stages, Hudson River, Poulations, Environmental effects.

In this evaluation of the potential effects of the Indian Point Nuclear Power Station on the biota of the Hudson River estuary, representatives of all trophic levels, including microbial decomposers, phytoplankton, herbiverous and carnivorous zooplankton, small eggs and larvae of invertebrates and fish were considered. Laboratory thermal tolerance studies indicated that significant decreases in bacterial abundance occurred only at temperatures higher than those projected for normal plant operation. A significant decrease in ATP concentrations was noted in water samples obtained from condensers being chlorinated but data indicated that recovery to intake levels would occur before the water left the discharge canal. There was no evidence that the Indian Point facility was altering the abundance or species composition of phytoplankton. Microzooplankton numbers and species composition varied with seasonal factors. Macrozooplankton showed some mortalities with thermal stress and chlorination. Tolerance of fish eggs and larvae to temperature elevations varied with the developmental stages tested. (See also W76-08628) (Chilton-ORNL)
W76-08633

HUDSON RIVER STRIPED BASS LIFE CYCLE MODEL,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
J. P. Lawler, R. A. Norris, G. Goldwyn, K. A. Abood, and T. L. Englert.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 83-94, 13 fig, 10 ref.

Descriptors: *Model studies, *Growth stages, *Striped bass, Life cycles, *Hudson River, Mortality, Population.

A mathematical model was designed to simulate the life cycle of the striped bass in the Hudson River with the goal of developing the capacity to predict the effect which the imposition of increased mortality at any point in the life cycle will have on the population as a whole. The model was based on the finite difference form of the one-dimensional advection-dispersion transport equation and was modified to include realistic source and decay terms for striped bass eggs and larvae. Results corresponded reasonably well with field data. The parameters of biological compensation, tidal effects and vertical non-homgeneity were not included in the model and the authors recommend improvement to include these factors. (See also W76-08628) (Chilton-ORNL)
W76-08634

ENTRAINMENT OF PLANKTONIC ORGANISMS INTO COOLING WATER SYSTEMS OF THREE MID-ATLANTIC THERMAL POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
L. D. Jensen, R. M. Davies, R. A. Smith, and A. S. Brooks.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 95-104, 6 fig, 2 tab, 10 ref.

Descriptors: *Entrainment, *Plankton, *On-site investigations, Sites, North Carolina, Virginia, Delaware, Powerplants, Fossil fuels.
Identifiers: Lake Norman, James River, Indian River.

The purpose of this research was to quantitatively examine, in field studies, plankton entrainment into the cooling water of three fossil-fueled power plants. This paper summarizes the characteristics of the three sites to be used in the study. Lake Norman, North Carolina is a large, deep, freshwater reservoir. There are no major discharges of organic waste streams into the lake but due to the stratified nature of the lake, its lower hypolimnetic layer was characterized by low dissolved oxygen levels. The James River, Virginia is a tidal river flowing into Chesapeake Bay. The James River receives considerable quantities of treated and untreated sewage. The Indian River, Delaware is an estuary connecting directly with the Atlantic Ocean. The estuary exhibits a range of surface salinity from 0 to 25 g/l in 20 km. The methods and results of this research are presented in additional papers. (See also W76-08628) (Chilton-ORNL)
W76-08635

PHYTOPLANKTON ENTRAINMENT STUDIES AT THE INDIAN RIVER ESTUARY, DELAWARE,
Johns Hopkins Univ., Baltimore, Md.
A. S. Brooks.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 105-111, 9 fig, 2 ref.

Descriptors: *Entrainment, *Phytoplankton, *Productivity, Cooling water, Temperature, Seasonal.
Identifiers: Indian River.

The effects of power plant entrainment on phytoplankton were found to be seasonal. Entrainment effects on carbon 14 uptake were primarily the result of temperature elevation. Mechanical factors influenced rates only slightly depending on the presence of fragile phytoplankton species. Rates of C 14 uptake were stimulated by a 6.5 degree C temperature rise when ambient temperatures were below 22 degrees C and reduced when ambient temperatures rose above 22 degrees C. Uptake rates were depressed from June through September while they were stimulated the remainder of the year. Length of exposure to elevated temperatures had little effect on uptake rates during the cooler months but long exposures during the summer depressed uptake production rates. (See also W76-08628) (Chilton-ORNL)
W76-08636

EFFECTS OF CONDENSER ENTRAINMENT ON ALGAL PHOTOSYNTHESIS AT MID-ATLANTIC POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. A. Smith, A. S. Brooks, and L. D. Jensen.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University on February 5-9, 1973. p 113-122, 12 fig, 2 tab, 10 ref.

Descriptors: *Entrainment, *Algae, Photosynthesis, Cooling water, Temperature, Mortality, Chlorination, Powerplants.
Identifiers: Lake Norman, James River, Gunpowder River, Indian River.

The response of algal photosynthetic rates to condenser temperature rises followed a consistent seasonal pattern at power plants located at Lake Norman, N. C., James River, Va., Gunpowder River, Md., and Indian River, Del. Rate stimulation from temperature rise prevailed when ambient temperature was low but was gradually replaced by rate depression when ambient temperature approached a summer maximum. A partial exception to this existed on Lake Norman where a hypolimnetic intake maintained low cooling water temperatures in summer. Irreversible effects of condenser entrainment on photosynthetic rates, which were assumed to reflect algal mortality, were observed only when intake temperature exceeded some threshold and during periods of chlorination. The temperature threshold varied seasonal and geographically but typically appeared between 25 and 30 degrees C. (See also W76-08628) (Chilton-ORNL)
W76-08637

EFFECTS OF CONDENSER DESTRUCTION OF ALGAE ON DISSOLVED OXYGEN LEVELS IN THE JAMES RIVER,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. A. Smith, and L. D. Jensen.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 123-129, 5 fig, 10 ref.

Descriptors: *Entrainment, *Dissolved oxygen, *Model studies, Algae, Mortality, Virginia.
Identifiers: James River(Va).

A model dealing with the dissolved oxygen system of a eutrophic region of the tidal James River is used to analyze the influence of algal destruction in the Chesterfield Power Station on oxygen levels. Results of model runs in the summer months indicated the net effect of all oxygen influencing factors associated with algal destruction is to lower dissolved oxygen concentrations by about 1 mg/l along an 11 km reach below the plant outfall. Flow and temperature conditions in fall months resulted in higher dissolved oxygen concentrations than those prevailing in summer. (See also W76-08628) (Chilton-ORNL)
W76-08638

ENTRAINMENT OF ZOOPLANKTON AT THREE MID-ATLANTIC POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. M. Davies, and L. D. Jensen.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland February 5-9, 1973. p 131-155, 39 fig, 11 tab, 39 ref.

Descriptors: *Entrainment, *Zooplankton, Powerplants, Cooling water, Temperature, Mortality.
Identifiers: Lake Norman, James River, Indian River.

The response of zooplankton to the effects of temperature rise, rapid pressure change, mechanical abrasion and biocidal action of chlorination were examined at Lake Norman, N. C., James River, Va., and Indian River, Del. Zooplankton mortality during entrainment was found to be dependent upon ambient temperatures and thermal elevations characteristic of each power plant. At the James River site the motility of zooplankton decreased in nearly direct proportion to ambient seasonal increases in water temperature, while at the Lake Norman site zooplankton motility decreased significantly at the lowest ambient water temperatures presumably due to doubling of the thermal elevation caused by operation of only one of the two cooling water pumps per unit during the coolest months of the year. (See also W76-08628) (Chilton-ORNL)
W76-08639

ZOOPLANKTON STUDIES AT MORGANTOWN,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. R. Heinle, H. S. Millsaps, Jr., and C. V. Millsaps.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9 1973. p 157-161, 2 tab, 5 fig, 2 ref.

Descriptors: *Entrainment, *Zooplankton, Chlorination, Density stratification, Tides, Copepods.
Identifiers: Acartia tonsa.

The influence of chlorination, tide, vertical distribution and augmentation pumping on a zooplankton index specie, Acartia tonsa, was investigated. In contrast to studies done at other sites, at Morgantown substantial numbers of dead copepods were found at the intake. High percentages of dead animals in the intake generally coincided with periods of slack tide. Results of statistical test of percentage alive during operating condition 1:499 kg (1100 lbs) of chlorine showed that there were no significant mortalities of Acartia tonsa between either the intake and the condenser or the intake and the effluent. Vertical stratification of copepods in the water column outside the power plant was greatest during flood tide and ebb tide and least during slack tide. (See also W76-08628) (Chilton-ORNL)
W76-08640

THE EFFECTS OF ENTRAINMENT ON PHYTOPLANKTON AT THE MORGANTOWN STEAM ELECTRIC STATION, POTOMAC RIVER ESTUARY, SEPTEMBER 5-8, 1972,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. A. Flemer.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9 1973. p 163-164, 2 fig, 4 ref.

Descriptors: *Entrainment, Zooplankton, Photosynthesis, Chlorophyll, Chlorination, Pumping, Estuaries, *Potomac River, Phytoplankton.
Identifiers: Morgantown Steam Electric Station.

Test conditions included no chlorine with augmentation pumping, no chlorine and no augmentation pumping, chlorine and no augmentation pumping. Samples were collected at the intake, the condensers and near the end of the effluent canal. Chlorophyll alpha concentration was used as an index of phytoplanktonic standing crop and the rate of C 14 uptake as an estimate of the photosynthetic rate. (See also W76-08628) (Chilton-ORNL)
W76-08641

BIOCHEMICAL STUDIES OF ENTRAINED PHYTOPLANKTON AT THE MORGANTOWN MARYLAND POWER PLANT,
Maryland Univ., Solomons. Chesapeake Biological Lab.
R. P. Morgan, II, D. A. Flemer, L. A. Noe, and V. J. Rasin, Jr.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 165-168, 3 tab, 6 ref.

Descriptors: *Entrainment, *Phytoplankton, *Biochemistry, Powerplants, Analytical techniques, Maryland.
Identifiers: Morgantown Steam Electric Station(Md).

The studies reported used the respiratory electron transport system (ETS), total proteins, ATP and ATPase activity as indices of the physiological state of phytoplankton community under power plant influence. Tests indicated that the protein only showed variation in relation to time. ETS activity in the effluent canal was about 15% higher than the intake indicating that there is reduced respiration through the condenser because of chlorination, mechanical effects or heat. Total ATP also showed a reduction of about 46%, when condenser values are compared to intake values. ATPase activity of the community increased by 39% after passage through the condenser and by 22% at the effluent canal. (See also W76-08628) (Chilton-ORNL)
W76-08642

MORGANTOWN ENTRAINMENT. PART IV. PHYTOPLANKTON TAXONOMIC STUDIES,
R. A. Mulford.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 169-175, 12 fig.

Descriptors: *Entrainment, *Phytoplankton, *Systematics, Powerplants, Screens, Algae, Biological communities, Maryland.
Identifiers: Morgantown Steam Electric Station(Md).

Two sample periods were chosen for the studies reported in this paper. One period was in late summer under maximum ambient heat conditions and one in December with lower ambient heat conditions and plant operating conditions having no chlorination and no augmentation pumping. Species composition of the net community for the warmer period provided a total of 79 species, 85% of which were dominated by the blue-green algae, Anacystis cyanea. Community composition for the December period was composed of 106 species with the blue green algae still the dominant organism. Approximately 66% of the net phytoplankton were immediately killed upon passage through the plant in the warm period. Approximately 15% were killed as a result of plant passage during the December test period. (See also W76-08628) (Chilton-ORNL)
W76-08643

RESPONSE OF PHYTOPLANKTON TO THERMAL STRESS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
M. E. Gurtz, and C. M. Weiss.
In: Entrainment and Intake Screening, Proceedings of the Sceond Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 177-185, 19 fig, 14 ref.

Descriptors: *Entrainment, *Phytoplankton, Productivity, Thermal stress, Growth rates, Screens.

The goals of this study were to define the relationship between the intake temperature, the magnitude of temperature rise and phytoplankton productivity as measured by C 14 uptake and to examine the relationship between the thermal effect and the growth capability of the phytoplankton under controlled laboratory conditions. A general pattern of increasing growth response with greater thermal stress was apparent, with smallest differences in the peak yields occurring at the lowest intake temperatures. (See also W76-08628) (Chilton-ORNL)
W76-08644

ENTRAINMENT STUDIES AT TURKEY POINT ON BISCAYNE BAY: HAVE THERMAL EFFECTS AFFECTED THE PLANKTON OF BISCAYNE BAY,
Air and Water Research, Inc., Gainesville, Fla.
J. B. Lackey.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 187-191, 3 fig.

Descriptors: *Entrainment, *Thermal stress, Plankton, Temperature, Algae, Thermal pollution, Florida.
Identifiers: Biscayne Bay(Fla).

Four years of research into the question of thermal effects are reported. It was generally concluded that there are definite thermal limits for all organisms and that these limits are variable for different species. The damage to plankton in the Biscayne Bay area was found to be restricted in quantity and to small areas and to small volumes of water. As long as temperatures did not exceed 34 degrees C over long periods of time, damage was negligible and water masses which may have suffered damage to their biota exhibited good recuperative capability. (See also W76-08628) (Chilton-ORNL)
W76-08645

LABORATORY SIMULATION OF POWER PLANT EFFECTS: RESPONSE OF SOME ESTUARINE PHYTOPLANKTERS TO TIME TEMPERATURE COMBINATIONS,
Academy of Natural Sciences of Philadelphia, Pa.
K. Mountford, R. S. Mullen, and R. S. Shippen.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 193-198. 10 fig, 5 ref.

Descriptors: *Entrainment, *Model studies, *Phytoplankton, Temperature, Time, Thermal stress, Thermal pollution.

In this laboratory simulation, a replicated 4 X 4 factorial matrix design was used to evaluate the response of phytoplankton to thermal shocks of 1 to 15 degrees C for exposure times ranging from 0 to 12 min. It was concluded that both light and acclimation temperature play an important role in thermal response of organisms. Certain communities of natural phytoplankton may be able to better withstand mild thermal shocks by seasonal shifts in the dominant species. There is a tendency for depressions to occur at relatively lower thresholds during the application of stress than during the recovery period. (See also W76-08628) (Chilton-ORNL)
W76-08646

TRAVELING SCREENS FOR TURBINE INTAKES OF HYDROELECTRIC DAMS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 8I.
W76-08647

FISH DIVERSION SYSTEMS AND BIOLOGICAL INVESTIGATION OF HORIZONTAL TRAVELING SCREEN MODEL VII,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 8I.
W76-08648

VULNERABILITY AND SURVIVAL OF YOUNG CONNECTICUT RIVER FISH ENTRAINED AT A NUCLEAR POWER PLANT,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
For primary bibliographic entry see Field 8I.
W76-08656

STATUS OF AIR BUBBLE FISH PROTECTION SYSTEM AT INDIAN POINT STATION ON THE HUDSON RIVER,
Consolidated Edison Co. of New York, Inc., New York. Office of Environmental Affairs.
For primary bibliographic entry see Field 8I.
W76-08657

PRELIMINARY STUDIES ON THE EFFECTS OF AIR BUBBLES AND INTENSE ILLUMINATION ON THE SWIMMING BEHAVIOR OF THE STRIPED BASS (MORONE SAXITALIS) AND THE GIZZARD SHAD (DOROSOMA CEPEDIANUM),
Westinghouse Electric Corp., Phildelphia, Pa. Environmental Systems. Dept.
For primary bibliographic entry see Field 8I.
W76-08658

A HIGH CAPACITY SAND FILTER FOR THERMAL POWER PLANT COOLING WATER INTAKES PART I: MODEL STUDIES AND FOULING CONTROL TECHNIQUES,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 8I.
W76-08660

A HIGH CAPACITY SAND FILTER FOR THERMAL POWER PLANT COOLING WATER INTAKES PART II: DESIGN CONCEPT,
Northwest Nuclear Power Associates, Seattle, Wash.
For primary bibliographic entry see Field 8I.
W76-08661

DEVELOPMENT OF BIOLOGICAL DESIGN CRITERIA FOR FISH SCREENS AND BARRIERS,
Kramer, Chin and Mayo, Inc., Seattle, Wash.
For primary bibliographic entry see Field 8I.
W76-08662

ABUNDANCE AND BIOMASS OF BACTERIOPLANKTON OF 'TASTAKA' PONDS, (IN RUSSIAN),
M. I. Novozhilova, and S. A. Abdrashitova.
Izv Akad Nauk Kaz SSR Ser Biol. 6, p 42-45, 1974.

Descriptors: *Fish hatcheries, *Plankton, *Biomass, Fertilizers, Bacteria, Ponds.
Identifiers: Kazakh-SSR, *Tastaka Pond, USSR.

Fertilization of the Tastaka fish-rearing ponds in the Kzyl-Orda region of the Kazakh SSR (USSR) with P salts had a weak effect on the development of bacterioplankton, but the application of N-P mixtures increased production considerably. The application of N-P fertilizers based on the pond's need for biogenic elements promoted a maximum increase of abundance and biomass of microorganisms and greatly reduced the expenditures for fertilizers during rearing of white anur larvae.--Copyright 1975, Biological Abstracts, Inc.
W76-08664

ROLE OF FAR EASTERN HERBIVOROUS FISH IN ECOSYSTEMS OF NATURAL WATER BODIES USED FOR ACCLIMATIZATION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Ichthyology.
G. V. Nikol'skii, and D. D. Aliev.
Vopr Ikhtiol. 14(6), p 974-979, 1974.

Descriptors: Rivers, *Carp, Phytoplankton, Plankton, Fish populations, *Cyanophyta, Algae, Ecosystems, Fish food organisms.
Identifiers: Aristichthys-Nobilis, Ctenopharyngodon-Idella, Hypophthalmichthys-Molitrix, Microcystis, Russian-SFSR, *USSR.

An analysis of the fish fauna of the Amur River (Russian SFSR, USSR) showed that grass carp Ctenopharyngodon idella and silver carp Hypophythalmichthys molitrix feeding on phytoplankton did not have any effect on the numbers of other fish. The same 2 spp.; variegated carp, Aristichthys nobilis and wild carp Cyprinus carpio living in the Kara Kum Canal feed on phytoplankton and blue-green algae, mainly Microcystis. A study of this canal in 1967-1973 revealed an increase in fish yield due to the colonization of this area by these phytophilic fish. The yield of C. carpio increased especially.--Copyright 1975, Biological Abstracts, Inc.
W76-08666

A SIX-YEAR WATER, PHOSPHORUS, AND NITROGEN BUDGET FOR SHAGAWA LAKE, MINNESOTA,
National Environmental Research Center, Corvallis, Oreg. Eutrophication and Lake Restoration Branch.
K. W. Malueg, D. P. Larsen, D. W. Schults, and H. T. Mercier.
Journal of Environmental Quality, Vol. 4, No. 2, p 236-242, April-June 1975. 11 fig, 5 tab, 11 ref.

Descriptors: *Phosphorus, *Nitrogen, Water pollution, *Water pollution effects, *Eutrophication, *Hydrologic budget, Nutrients, Waste water, *Minnesota.
Identifiers: *Shagawa Lake(Minn).

Water, phosphorus, and nitrogen budgets of eutrophic Shagawa Lake, Minnesota were determined from 1967-1972 to assist in defining the sig-

nificance of the loading from the city of Ely secondary waste water treatment plant to the trophic state of the lake. Ely's municipal waste water accounted for about 80% of the P, 24% of the N, and only 2% of the water to Shagawa Lake while the major tributary, Burntside River, accounted for 66% of the water, 42% of the N, and only 11% of the P to the lake. An average of 30% of the P was retained within the lake. The water and nutrient budgets, along with field and laboratory studies, indicated that high levels of P from the municipal waste water treatment plant were mainly responsible for the eutrophic condition of Shagawa Lake. These studies led to the construction of a tertiary waste water treatment plant designed to remove 99% of the P from the secondary waste water effluent. (Skogerboe-Colorado State)
W76-08674

THE EFFECTS OF LINDANE ON THE MORPHOLOGY AND THE GROWTH OF SOME UNICELLULAR ORGANISMS, (IN FRENCH),
Paris-7 Univ. (France). Laboratoire de Physiologie Cellular Vegetale.
N. Jeanne-Levain.
Bull Soc Zool Fr. 99(1), p 105-109, 1974.

Descriptors: *Microorganisms, *Morphology, Animal growth, *Pesticides, Water pollution effects, *Growth rates.
Identifiers: Amphidinium-Carteri, Dunaliella-Bioculata, Euglena-Gracilis, *Lindane, Tetrahymena-Pyriformis, Unicellar organisms.

A study was made of the effects of lindane (gamma HCH) upon the cytological structure and the growth of 4 aquatic unicellular organisms: Amphidinium carteri (Dinoflagellate) Euglena gracilis (Flagellate), Tetrahymena pyriformis (Ciliate) Dunaliella bioculata (Volvocales). A great diversity in the sensitivity to the pesticide was noticed in these different species. Generally the high concentrations of lindane are lethal and the lower concentrations induce a complete or partial delay in the cell multiplication. Microscopic examinations have shown some modifications of the behavior and the morphology of the treated organisms. Besides a specific inhibition of cytokinesis was observed in the Algae Dunaliella bioculata.--Copyright 1975, Biological Abstracts, Inc.
W76-08676

CHLORINATED HYDROCARBON PESTICIDES AND MERCURY IN COASTAL BIOTA, PUERTO RICO AND THE U.S. VIRGIN ISLANDS--1972-74,
Georgia Univ., Brunswick. Marine Resources Extension Center.
For primary bibliographic entry see Field 5B.
W76-08683

BASELINE CONCENTRATIONS OF POLYCHLORINATED BIPHENYLS AND DDT IN LAKE MICHIGAN FISH, 1971,
National Water Quality Laboratory, Duluth, Minn.
For primary bibliographic entry see Field 5A.
W76-08685

SEASONAL STUDIES ON THE RELATIVE IMPORTANCE OF DIFFERENT SIZE FRACTIONS OF PHYTOPLANKTON IN NARRAGANSETT BAY (USA),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
E. G. Durbin, R. W. Krawiec, and T. J. Smayda.
Marine Biology, Vol. 32, No. 3, p 271-287, 1975. 8 fig, 2 tab, 33 ref. NSF GA 31319X.

Descriptors: *Productivity, *Marine algae, *Microorganisms, *Succession, *Phytoplankton, Temporal distribution, Dominant organisms, Size, Diatoms, Nannoplankton, Varieties, Bays, Temperature, Growth rates, Temperate, Cold regions, *Rhode Island, Estuaries, Seasonal, Eutrophication, Water pollution effects.
Identifiers: *Narragansett Bay(RI), Flagellates, Netplankton.

Between November 1972-October 1973, phytoplankton in Narragansett Bay were separated into sizes (less than 20, 20-60, 60-100, and over 100 micrometers) to determine their productivity. Cell numbers, species composition, chlorophyll, adenosine triphosphate levels, and carbon assimilation rates were determined to help define successional changes in composition, rates of turn-over, and roles of individual species. Diatoms were dominant in fall and winter-spring blooms and flagellates in summer. Nannoplankton (less than 20 micrometers) were most important, accounting for 46.6% of annual biomass as chlorophyll-a and 50.8% of total production. The relative importance of the fractions varied seasonally. Netplankton (over 20 micrometers) were most important in winter-spring and fall and nannoplankton in summer. Yearly mean assimilation numbers were not significantly different, but during winter-spring blooms assimilation numbers were higher for netplankton than nannoplankton. Temperature changes caused most of the variability in assimilation numbers. Growth rates were high. Short cycles in which the dominant species changed were related to changes in physiological population states. Usually higher growth rates were observed during peaks of phytoplankton abundance and lower growth rates between peaks. High growth rates and assimilation numbers suggested that phytoplankton were not generally nutrient-limited, consequently regeneration must be very rapid when in situ nutrient levels are low. (Buchanan-Davidson--Wisconsin)
W76-08686

MICROBIAL ATP AND ORGANIC CARBON IN SEDIMENTS OF THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
R. L. Ferguson, and M. B. Murdoch.
Estuarine Research, Vol. 1, p 229-250, 1975. 8 fig, 2 tab. AEC AT(49-7)-5.

Descriptors: Microorganisms, Organic compounds, *Carbon, *Sediments, *Estuaries, *North Carolina, Analytical techniques, *Standing crops, *Detritus, Chlorophyll, Measurement, Instrumentation, Cores, Seasonal, Food webs, Statistical methods, Photometry.
Identifiers: *Adenosine triphosphate, *Newport River Estuary(NC), *Organic carbon.

Methods for the quantitative estimation of the standing crops of organic carbon in sediment communities (allochthonous detritus, detritus, heterotrophic and autotrophic microbes, and microbial fauna) were devised. Seasonal surveys of microorganism, macroscopic infauna, and nekton biomass in the Newport River Estuary, North Carolina, are being made. Standing crops of carbon in heterotrophic and autotrophic microorganisms in water and sediments were estimated from adenosine triphosphate (ATP) and chlorophyll-a measurements. ATP was extracted with boiling tris (hydroxymethyl) aminomethane buffer. The extraction efficiency from sediment was approximately 47%. ATP was strongly absorbed by acid-washed clay, but ATP extractability from natural sediment was independent of its clay content. Instrumentation for the determination of as little as 0.0005 micrograms of ATP per ml of extract and a hand-coring device for collecting samples of shallow water sediment are described. The standing crop of heterotrophic microbes increased 8.4-20.9 g c/sq m from winter to summer in the upper 15 cm of sediment over the whole estuary. This increase was associated with a drop in detritus and increase in macroscopic infauna. Implications of seasonal carbon distributions in detritus, microbes, and infauna are discussed in relation to the apparent carbon flows through the detritivore food web. (Buchanan-Davidson--Wisconsin)
W76-08687

DETRITUS PRODUCTION IN COASTAL GEORGIA SALT MARSHES,
Georgia Univ., Sapelo Island. Marine Inst.
R. J. Reimold, J. L. Gallgher, R. A. Linthurst, and W. J. Pfeiffer.
Estuarine Research, Vol. 1, p 217-228, 1975. 7 fig, 2 tab, 20 ref.

Descriptors: *Rooted aquatic plants, *Detritus, *Salt marshes, *Estuaries, *Georgia, Standing crops, Biomass, Primary productivity, Tidal effects, Eutrophication, Water pollution effects.
Identifiers: Detritus production, *Duplin Estuary(Ga), Spartina alterniflora, Juncus roemerianus.

Changes in detritus production flux were measured each month in three salt marsh areas of the Duplin Estuary, Sapelo Island, Georgia, and detritus production calculated. Standing dead material often exceeded living material in the short-form Spartina alterniflora, but was about equal in other areas. The average dead material standing crop was highest in Juncus roemerianus and lowest in short-form S. alterniflora. Average detritus production fluxes were: 7 mg/g/day for tall-form S. alterniflora, 18 mg/g/day for short-form S. Alterniflora, and 7 mg/g/day for J. roemerianus. Average monthly detritus production was 197.9 g/sq m for J. roemerianus, and 113.6 g/sq m for short-form S. alterniflora. Mean annual detritus production from aerial portions of plants (weighted for percentage of watershed occupied by each stand) was 1845.8 g/sq m/yr. Flux rates of J. roemerianus and tall form S. alterniflora were low but detritus production high due to large biomass; short-form S. alterniflora biomass was low and flux rate more than twice that of the other stands. Monthly detritus productions varied. Minerals in dead material differed between species and seasons; phosphorus and molybdenum were lower and manganese higher in J. roemerianus. Calcium, magnesium, boron, and strontium were higher in August than in March in all species. (Buchanan-Davidson--Wisconsin)
W76-08688

PHOSPHORUS FLUX AND CYCLING IN ESTUARIES,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
D. L. Correll, M. A. Faust, and D. J. Severn.
Estuarine Research, Vol. 1, p 108-136, 1975. 17 fig, 2 tab, 31 ref.

Descriptors: Analytical techniques, *Phosphorus, *Cycling nutrients, *Estuaries, *Chesapeak Bay, Periphyton, Plankton, Tidal marshes, Radioisotopes, Sediments, Phosphates, Absorption, Nannoplankton, Metabolism, Dinoflagellates, Bacteria, Chemical analysis, Kinetics, Chromatography, Microscopy, Detritus, Aquatic plants, *Pollutant identification.
Identifiers: *Rhode River(Chesapeake Bay), Microautoradiography.

To demonstrate application of experimental measurements of phosphorus flux rates and cycling in estuaries, results obtained in tidal marsh and mudflat periphyton and plankton communities of the Rhode River, a subestuary of Chesapeake Bay are presented. Phosphorus loading of a tidal marsh dominated by Typha angustifolia caused rapid radioactivity decreases. Microbes rapidly took up radioactive orthophosphate, the acid-labile fraction peaked quickly, then levelled off. Typha roots apparently absorbed phosphate from surface detritus, not tidal waters or deep sediments. Phosphate absorbed by periphyton was metabolically converted into organic phosphorus compounds. Phosphorus uptake rates were about equal to release rates. Effects of light in stimulating phosphorus uptake were about cancelled by light inhibition of heterotrophic uptake, indicating that uptake was not directly caused by photosynthesis

or autotrophs. Iodoacetic acid inhibited uptake, suggesting biological, no physical, uptake. Nannoplankton phosphorus assimilation was 300-500 times that of large dinoflagellates. Phosphorus uptake was greatest by bacteria on surfaces of suspended sediments and detritus. Phytoplankton took up some orthophosphate in the light. Filter feeders (especially ciliated protozoa) ingested bacteria and phytoplankton, then released most of the phosphorus as dissolved orthophosphate and organic phosphorus. Methods used were chemical analyses, radioactive phosphorus uptake, chase kinetics, column chromatography, continuous-flow pulse-labeling, microscopic examinations, and microautoradiography. (Buchanan-Davidson--Wisconsin)
W76-08689

CAUSES AND PROBABLY CORRECTIVES FOR OXYGEN DEPLETION FISH KILLS IN THE DICKINSON BAYOU ESTUARY: A FIELD STUDY AND SIMPLIFIED ALGAL ASSAY,
Texas Parks and Wildlife Dept., Seabrook. Seabrook Marine Lab.
K. Knudson, and C. E. Belaire.
Contributions in Marine Science, Vol. 19, No. 48, p 37-48, 1975. 7 fig, 10 ref.

Descriptors: *Oxygen sag, *Eutrophication, *Sewage effluents, *Fishkill, *Estuaries, *Texas, *Bioassay, Nutrient removal, Diurnal, Treatment facilities, Tertiary treatment, Dissolved oxygen, Tidal effects, Sewage treatment, Chlorophyll, Phosphorus.
Identifiers: *Dickinson Bayou(Tex), *Algal assay.

Summer fishkills due to oxygen depletion caused by dense algal blooms have occurred during the night or early morning in parts of the Dickinson Bayou, Texas, upstream from two sewage treatment plants. In the spring freshwater runoff dominates the circulation, salinity is negligible, and dissolved oxygen near saturation. Precipitation and runoff are negligible in summer; tides carry saline waters and sewage effluents upstream. Little mixing occurs, so bottom dissolved oxygen is low. Phosphorus and chlorophyll parallel saline concentrations. Algal density was less above the tidal influence and downstream from plant outfalls. When algal concentrations are dense, dissolved oxygen concentrations show extreme diel fluctuations. Algal assays indicated that tertiary waste treatment would reduce algal biomass two to four-fold as compared to secondary treatment. Thus, phosphorus removal may reduce algal standing crops 1/4-1/2, eliminate extreme diel dissolved oxygen fluctuations, and reduce the potential for fishkills. It was concluded that the two treatment plants were poorly located, because they discharge into normally stagnant, eutrophic, unstable areas. Site selection for waste treatment plants on tidal streams should be carefully considered to avoid nutrient build-up. (Buchanan-Davidson--Wisconsin)
W76-08690

NITROGEN UTILIZATION DURING SPRING BLOOMS OF MARINE PHYTOPLANKTON IN BEDFORD BASIN, NOVA SCOTIA, CANADA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
S. A. M. Conover.
Marine Biology, Vol. 32, No. 3, p. 247-261, 1975. 6 fig., 6 tab., 35 ref.

Descriptors: *Marine algae, *Nitrogen compounds, *Spring, *Canada, Diatoms, Nitrates, Nitrites, Ammonia, Urea, Limiting factors, Proteins, Lipids, Carbohydrates, Carbon, Dinoflagellates, Photosynthesis, Chlorophyll, Eutrophication, *Phytoplankton.
Identifiers: *Bedford Basin(Nova Scotia), Carotenoids, Thalassiosira fluviatilis, Thalassiosira nordenskioldii.

Spring phytoplankton flowering was dominated by diatoms using nitrates, nitrites, ammonium, and some urea. Flowering seemed dependent on nitrates in sea water. Environmental nutrient depletion occurred several days before the population maxima, so internal nitrogen storage carried diatoms populations through their remaining divisions. Total nitrogen/cell decreased as blooms matured, but intracellular nitrogen distribution remained constant. Protein nitrogen was 57.2% total particulate nitrogen. Protein carbon was greater in cells in developing and post-blooms than mature blooms. Lipid carbon was fairly constant, decreasing slightly in post-bloom dinoflagellates. Nitrogen-deficient phytoplankton channeled photosynthate into carbohydrates. Carotenoid/chlorophyll was useless for assessing population age or nitrient deficiency. Lipid/protein varied, was highest in mature floating blooms, and lowest in older, post-blooms, and sinking blooms. Carbohydrate/protein was higher in mature blooms and sinking phytoplankton than young blooms. Carbon/nitrogen was moderate in pre- and post-blooms, low in young blooms, and maximum in mature blooms. All nitrogen sources were normally used simultaneously, except urea. There was no threshold ammonium concentration above which nitrate was not used. Urea increases were observed occasionally. As blooms progressed, there is less response to added nitrogen. Nitrate apparently regulated bloom magnitude. Thalassiosira fluviatilis used all nitrogen sources, but T. nordenskioldii did not use urea. (Buchanan-Davidson--Wisconsin).
W76-08691

ENERGY TRANSFER IN SEDIMENTARY ENVIRONMENTS: THE CASE OF SULFATOREDUCERS: I. THE ORGANIC ACIDS IN LAGOON AND MARINE SEDIMENTS (GOLFE DU LION), (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
G. Cahet.
Vie Milieu Ser B Oceanogr. 24(2), p 235-255, 1974.

Descriptors: Lagoons, *Sediment transport, *Littoral, *Gulfs, Europe, *Sediment load, *Sulfates, Water pollution control, *Organic acids, *Acids.
Identifiers: *France, Golf du Lion, Mediterranean.

In the Mediterranean margino-littoral sediments of the Golfe du Lion (France), the temporal variations of organic acids depend upon their binding to deposit particles. A great part of the organic acid reserve is consistently found in the fraction that is most strongly bound to the sediment. The ratios of the different fractions have characteristic mean values. In lagoons, these compounds suggest possible heterotrophic action. In early diagenesis, glucides that are easily assimilated disappear rapidly. From a biological viewpoint, this emphasized the importance of the role of organic acids; but the amounts present do not account for the action of the sulfate reducing heterotrophs present. These microflorae must possess some metabiotic adaptions for their development.--Copyright 1976, Biological Abstracts, Inc.
W76-08718

ONE-DIMENSIONAL TEMPERATURE PREDICTIONS IN UNSTEADY FLOWS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-08738

COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W76-08746

WATER QUALITY EFFECTS OF A DREDGING DISPOSAL AREA,
Northwestern Univ., Evanston, Ill. Technological Inst.
R. J. Krizek, B. J. Gallagher, and G. M. Karadi.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE2, Proceedings Paper 12040, p 389-409, April 1976. 7 fig, 6 tab, 5 ref, 1 append. EPA 15070-GCK, R-800948.

Descriptors: *Dredging, *Water quality, *Waste disposal, Environmental engineering, *Channel improvement, Analytical techniques, Bottom sampling, Chemical analysis, Environmental effects, Landfills, Water pollution, Pollutants, Suspended solids, Waste storage, Sludge disposal, Pesticide residues, Sediments, Settling basins, Ohio.
Identifiers: Diked containment area, *Toledo(Ohio), *Dredge spoil, *Maumee River(Ohio), Dredges, Confined environments, Water budget, Disposal sites, Hopper dredge, Maintenance dredging, Diked enclosure.

The effect of the settling-basin concept on the water quality associated with a typical disposal site for polluted maintenance dredgings, and the fate of pollutants during a typical dredging and disposal cycle were determined between August 20, 1972 and December 20, 1972, in Toledo, Ohio. Over 100 samples of slurry influent, overflow effluent, groundwater, ambient river water, bottom sediments, and material from the hopper bins and overflow waters were collected and analyzed for standard physical, chemical, and microbiological parameters. It was concluded that only a small fraction of the pollutants are discharged via the overflow weir into the ambient river water; this is attributable to the fact that the polluting substances tend to associate with the solid particles, which settle out of the suspension and are retained within the diked enclosure. The water quality of the effluent resembled that of the ambient river water used as a carrier to pump the dredgings in slurry form from the hopper dredge into the disposal area. (Henley-ISWS)
W76-08749

5D. Waste Treatment Processes

CONTINUED EVALUATION OF IN-SITU-FORMED CONDENSATION POLYMERS FOR REVERSE OSMOSIS MEMBRANES,
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
For primary bibliographic entry see Field 3A.
W76-08116

RESEARCH ON ULTRAFILTRATION SYSTEMS UNDER SEAWATER DESALTING CONDITIONS,
Oxy Metal Industries (Intra) Inc., Santa Ana, Calif. Systems Engineering Div.
For primary bibliographic entry see Field 3A.
W76-08117

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 1-5 MGD PLANTS, PLANTS FOR HIGH PRODUCT RECOVERY,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08118

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 3-25 MGD LOW PRESSURE PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08119

ENVIRONMENTAL QUALITY AND INFLATION: A REGIONAL PERSPECTIVE ON THE COST-PUSH IMPACT OF THE 1972 PURE WATER LEGISLATION,
Lyndon B. Johnson School of Public Affairs, Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08151

WATER QUALITY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08155

EFFECT OF FLOCCULANTS ON THE SEDIMENTATION OF ORGANIC SOLIDS IN TANNERY UNHAIRING EFFLUENTS,
Eastern Regional Research Lab., Philadelphia, Pa.
J. E. Cooper, W. F. Happich, E. H. Bitcover, E. F. Mellon, and E. M. Filachione.
Presented at 29th Annual Purdue Industrial Waste Conference, May 8, 1974, Purdue University, West Lafayette, Indiana. 24 p, 1 fig, 9 tab, 8 ref.

Descriptors: *Tannery wastes, *Waste water treatment, *Flocculation, Effluents, Industrial wastes, *Polelectrolytes, *Electrolytes, Organic wastes, Solid wastes, Settling basins.
Identifiers: Unhairing effluents.

Effects were determined of various flocculants on the sedimentation of organic solids in tannery unhairing effluents. Several methods and agents were tried, including varying the order of addition. Alum was found unsuitable because of the need to lower the pH to 8 in order to cause flocculation which results in the release of hydrogen sulfide gas. Highest removals were obtained by first adding an anionic polyelectrolyte then a cationic polyelectrolyte followed by an inorganic electrolyte. Using this method, the COD was reduced by 56 percent and the volatile organic solids by 98 percent. (EPA-Corvallis)
W76-08164

SPRAY IRRIGATION OF POLUTRY PROCESSING WASTEWATER,
Campbell Soup Co., Camden, N. J.
D. D. Deemer.
Instrumentation in the Food and Beverage Industry, 1972, No. 1, p. 25-30. 6 fig, 4 tab, 3 ref.

Descriptors: *Food processing industsry, *Waste water treatment, *Return flow, Irrigation, Infiltration, Drainage, Treatment facilities, Industrial wastes, Biochemical oxygen demand, Suspended solids.
Identifiers: *Poultry processing wastes, *Spray irrigation treatment.

A case history and research and research evaluation of a spray irrigation system used for the treatment of poultry processing wastewater is presented. The treatment system consists of an infiltration-type spray irrigation system with the addition of an underground perforated drainage pipe network which collects some of the treated wastewater and transports it to a polishing pond. The system treats between 3 and 4 million gallons of wastewater per day. Studies have shown the treatment system to be extremely efficient from a BOD and suspended solids removal standpoint, averaging better than 98 percent removal. The research evaluation also covers the influence which soils and plant cover have on the efficiency of the system. (EPA-Corvallis)
W76-08165

UTILISATION OF BLOOD,
Agricultural Research Council, Langford (England). Meat Research Inst.
For primary bibliographic entry see Field 3E.
W76-08166

O2 INJECTION DOUBLES/TRIPLES BIOLOGICAL WASTE TREATMENT ACTIVITY.
Food Processing, September 1974, p. 56-57.

Descriptors: *Food processing industry, *Waste water treatment, *Oxygenation, *Biological treatment, Industrial wastes, Economic feasibility.
Identifiers: *Meat processing wastes, Upgrading biological treatment.

Biological reaction capacity of conventional activated sludge aeration tanks is doubled or tripled by the installation of a modular oxygen treatment system. Two units were used to upgrade an overloaded 60,000 gpd, 400 mg/l BOD5 treatment system, the facility now handles 120,000 gpd meat processing waste of 800 mg/l BOD5. The unit is designed for use in water depths of 8-30 feet. It has one moving shaft and impeller. No cover is required since the mixed liquor in the aeration tank is at a lower dissolve oxygen content than atmospheric equilibrium. Several module sizes will be available. Capital investment for the system is in the area of $100,000 per million gallons per day of capacity. (EPA - Corvallis)
W76-08167

DUCK-PROCESSING WASTE,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 3E.
W76-08168

REDUCTION IN OXYGEN DEMAND OF ABATTOIR EFFLUENT BY PRECIPITATION WITH METAL,
New York State Agricultural Experiment Station, Geneva.
R. H. Walter, R. M. Sherman, and D. L. Downing.
Journal Agriculture Food Chemistry Vol. 22, No. 6, p 1097-1099, 1974. 2 fig, 3 tab, 14 ref.

Descriptors: *Food processing industry, *Waste water treatment, *Oxygen demand, Treatment, *Chemical precipitation, Effluents, Industrial wastes, *Metals, Chemical oxygen demand, Biochemical oxygen demand, Iron, Manganese, Cobalt, Aluminum, Copper, Cesium.
Identifiers: *Meat packing wastes pretreatment.

One hundred per cent reduction in oxygen demand (BOD and/or COD) of abattoir effluent was achieved experimentally by generating in situ metallic complexes with which hemoglobin and other large molecules were precipitated. Sulfates of Fe(II), Fe(III), Co(II), Cu(II), Mn(II), Ce(IV), and Al(III) were dissolved in the effluent, and after a short interval of time, the pH was adjusted to pH 7.0-9.6 with NH4OH. Environmental considerations limited further studies to Fe2(SO4)3. The weight ratio of effluent treated to salt used was in the order of 103, which was equivalent to a COD/Fe2(So4)3 ratio of approximately 2. The critical parameter was pH. (EPA - Corvallis)
W76-08169

EGG-PROCESSING PLANT WASTES,
South Dakota State Univ., Brookings.
For primary bibliographic entry see Field 3E.
W76-08170

WATER-RECYCLE WASHING OF REFINED SOYBEAN OIL: PLANT SCALE EVALUATION,
Anderson Clayton Foods, Inc., Sherman, Tex.
For primary bibliographic entry see Field 3E.
W76-08171

PROTEIN AND FAT RECOVERY FROM EFFLUENTS,
Alwatech A. S., Oslo (Norway).
A. P. Hopwood, and G. D. Rosen.
Process Biochemistry, Vol. 7, No. 3, p. 15-17, March 1972. 4 tab, 9 ref.

Descriptors: *Food Processing Industry, *Waste Water Treatment, *Chemical Precipitation, By-products, *Flotation, Proteins, Biochemical oxygen demand, Effluents, Industrial wastes, Poultry.
Identifiers: *Meat-Packing Wastes, *Poultry Processing Industry, LSA Process, Protein recovery, Fat recovery.

A process is described which separates water-insoluble solids, including fat, by flotation, or insoluble solids plus freshly co-precipitated protein plus fat by flotation after chemical precipitation. It is used for the treatment of slaughterhouse and poultry packing waste waters. Plants are in operation in Scandinavia and under construction in U. K. Economic aspects of effluent treatment and product utilization are covered. The Alwatech process makes use of lignosulfonic acid (LSA) which at pH 3 precipitates proteins from solution. It is capable of removing 70-90 percent of the BOD from a slaughterhouse or poultry processing plant along with most of the protein nitrogen. Advantages are: (1) low space requirements, (2) an economic advantage over biological treatment for strong wastes, and (3) sludge produced at 5-15 percent solids. (EPA - Corvallis)
W76-08172

PAUNCH HANDLING AND PROCESSING TECHNIQUES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 3E.
W76-08173

REPORT ON METHODS OF CHROME RECOVERY AND REUSE FROM SPENT CHROME TAN LIQUOR,
Cincinnati Univ., Ohio. Tanners' Council Lab.
R. A. Hauck.
Journal of the American Leather Chemists' Association Vol. 67, No. 10, p. 422-430, October, 1972. 3 tab, 9 ref.

Descriptors: *Tannery Wastes, *Waste Water Treatment, *Water reuse, Industrial wastes, Recycling.
Identifiers: Process Change, *Chromium recovery, Chromium reuse.

Three methods are reported of chrome recovery and reuse in order to utilize the unspent portion of chrome (about 30 percent) in the tanning process. These three methods are reuse through replenishment, direct reuse of the spent liquor, and chrome recovery. A review of past work in reuse, is presented with reports of successful operation. Suggestions are given on possible modifications of the processes covered in the review. Direct reuse of the spent liquor, in either the pickle liquor or as float in tanning is discussed. Several methods of chrome recovery are reviewed precipitation with an alkali will produce the chromium in a form suitable for reuse in a fresh liquor. Procedures are given for preparing the product for reuse along with tables showing the amount of various alkali necessary per quantity of chromic oxide. (EPA - Corvallis)
W76-08174

SOME ASPECTS OF TANNERY EFFLUENT CONTROL,
Garden State Tanning Co., Reading, Pa.
S. M. De.
Journal of the American Leather Chemists Association, Vol. 68, No. 8, p. 316-321, August 1973. 4 tab, 9 ref.

Descriptors: *Tannery wastes, Sulfides, Chromium, Chemical precipitation, *Waste water treatment, Industrial wastes, Pennsylvania, *Oxidation, Effluents, Treatment facilities.
Identifiers: Catalytic Oxidation, Process change, Chrome recovery.

Efforts to reduce the strength of the Garden State Tanning Co., Reading, Pennsylvania are reported. Initial efforts were toward the reduction of sulfide. A 40 percent decrease was obtained by adopting a hide processor. To reduce the remaining sulfide, several methods were evaluated including treating with ferrous sulfate to precipitate an insoluble ferrous sulfide, and oxidation of ferrous sulfide using manganese sulfate as a catalyst. Also studied was the use of nickel chloride and manganese chloride as catalysts. Pilot-plant experiments gave encouraging results for the use of manganese sulfate. Best oxidation was obtained when the amount of Mn++ added is one tenth the amount of S present in the system and when the catalytic agent is dissolved prior to addition in the aeration tank. Chrome was recovered using the optimum amount of lime and Primafloc A-10 (Rohm and Haas) for the most rapid precipitation without formation of cloudiness and discoloration. The most optimum quantities for every 170 liters of exhaust chrome liquor, were 852.7 grams lime powder and 157.5 grams Primafloc A-10. The chrome sludge was then dissolved in concentrated sulfuric acid forming chromium sulfate for reuse in tanning. (EPA - Corvallis)
W76-08175

TREATMENT OF TANNERY WASTEWATER FROM BONA ALLEN, INC., BUFORD, GEORGIA,
Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.
R. N. Kinman.
Journal of the American Leather Chemists Association, Vol. 68, No. 9, p. 370-392, September 1973. 2 fig, 15 tab, 2 ref.

Descriptors: *Tannery wastes, *Waste water treatment, Waste treatment, Industrial Wastes, Georgia, *Aerated lagoon, Activated sludge, *Treatment facilities.

The options studied for upgrading the Bona Allen, Inc., wastewater treatment plant at Buford, Georgia are described. Considered were treatment efficiencies of an activated sludge unit and an aerated lagoon for the tannery effluent. The existing system consisted of screening, equalization, chemical feed, primary clarification, trickling filter, and secondary clarification. The aerated lagoon was chosen for use after secondary clarification due to ease of operation and uniformity of the effluent. In the aerated lagoon over a 40 day operation period following percent removals were obtained; 48.1 for BOD5, 17.1 for color, and 17.2 for tannin. (EPA-Corvallis)
W76-08177

RECYCLING OF LIME-SULPHIDE UNHAIRING LIQUORS - I, SMALL-SCALE TRIALS,
Commonwealth Scientific and Industrial Research Organization, Parkville (Australia). Div. of Protein Chemistry.
C. A. Money, and U. Adminis.
Journal of the Society of Leather Technologists and Chemists, Vol. 58, p. 35-40, 1974. 5 tab, 5 ref.

Descriptors: *Tannery wastes, Sulfides, *Recycling, Industrial wastes, Waste water treatment, Water reuse.
Identifiers: Process change, Beamhouse wastes, *Unhairing liquors.

Results of small-scale trials on recycling of lime-sulfide unhairing liquors are reported in which the liquors have been recycled up to 27 times without deterioration in leather quality. Different soak methods were compared to determine which did not cause a buildup of salt in the liquor that would affect the swelling and unhairing. Matched-side trials were conducted comparing (1) conventional unhairing and unhairing with lime recycle after solids removal, (2) conventional unhairing and unhairing with lime recycle and no solids removal, and (3) unhairing using lime recycle with solids and unhairing using lime recycle without solids. All three trials produced no inferior quality leather. Fats accumulate in recycled lime liquors if the solids are not removed. Advantages of reutilizing lime liquors are the improved effluent quality and the savings in water use. The work has been extended to large-scale tannery trials. (EPA-Corvallis)
W76-08179

THE ROLE OF HIGH RATE BIO-FILTERS IN THE LEATHER INDUSTRY,
Water Pollution Research Lab., Stevenage (England).
D. A. Bailey, M. K. Leafe, K. S. Robinson, and S. Collins.
Journal of the Society of Leather Trades' Chemists, Vol. 56, p 200-214 (1972). 4 fig, 5 tab, 13 ref.

Descriptors: *Tannery wastes, *Waste water treatment, Waste treatment, Industrial wastes, Pre-treatment(Water).
Identifiers: *Bio-filter, Pretreatment.

Four possible applications of high rate bio-filters in the leather tanning industry are (1) as a pretreatment for effluents prior to municipal treatment, (2) as a roughing process prior to treatment in a conventional plant to reduce size and cost of new plants, (3) as a roughing process to relieve an overloaded existing plant, (4) as a 'partial' biological treatment for effluents discharged to river estuaries. Reports on pilot plant operation of the high-rate bio-filter in the leather industry show an average removal of 40 percent of the applied BOD. Chemical pretreatment with lime and iron or alum salts would reduce the size of subsequent biological treatment. Cost comparison with conventional filters shows the high-rate filter is preferable. (EPA-Corvallis)
W76-08180

A VERY RAPID LIMING AND TANNING PROCESS WITHOUT EFFLUENT,
Technische Hochschule, Darmstadt (West Germany). Institut fuer Makromolekulare Chemie.
For primary bibliographic entry see Field 3E.
W76-08181

NO-EFFLUENT TANNERY PROCESSES,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
For primary bibliographic entry see Field 3E.
W76-08182

RECENT INVESTIGATIONS INTO THE DISPOSAL OF TANNERY WASTE WATER,
Instituut TNO voor Leder en Schoenen, Waalwijk (Netherlands).
P. J. van Vlimmeren, and A. J. J. van Meer.
(Paper presented to the Tanner's Production Club of Canada, Toronto, April 19, 1974, 14 p, 8 slides, TNO number 187/74L).

Descriptors: *Tannery wastes, *Water consumption, *Waste water treatment, Costs, Industrial wastes, Sulfides, Oxidation lagoons, Chromium, Waste water disposal.
Identifiers: *Process change, Beamhouse waste, Tanhouse waste, Oxidation ditch.

New developments in the disposal of tannery waste water were reported. Three areas of concern are discussed and are as follows: (1) Reduction in the amount and degree of pollution of the effluent, (2) treatment of tannery wastewater and, (3) charges to be paid. Water use reduction is reported from 100-200 1/kg of hide to 25 1/kg by the introduction of batch washing to replace continuous rinsing. Other methods to reduce the waste load reported are mixing of beamhouse and tanhouse waste flows, hair-save unhairing, and unhairing in the first soaking liquor. In the latter case, after acidification to pH 3.5 and settling, the COD and nitrogen content in the effluent from soaking-unhairing was reduced by 89 to 90 percent, respectively. Tannery wastewater treatment is centered on the areas of sulfide removal, chromium removal, and biological oxidation. The recommended treatment for sulfides is oxidation after addition of a manganous salt as a catalyst. Due to increasing stringent regulations regarding chromium, the authors recommend recovery from the spent liquor and reuse in the tanning operations. For biological treatment, the advantages of an oxidation ditch are discussed with reports of successful full-scale operation. Various surcharge systems for payment when discharging to municipal treatment are discussed along with a system developed by the Institute for Leather and Shoe Research which is in use in Holland today. (EPA-Corvallis)
W76-08183

WASTE TREATMENT AND CONTROL AT LIVE OAK POULTRY PROCESSING PLANT,
Gold Kist Inc., Atlanta, Ga.
For primary bibliographic entry see Field 3E.
W76-08185

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, TEXTILE INDUSTRY.
Lockwood Greene Engineers, Inc., Spartanburg, S. C.
For primary bibliographic entry see Field 5G.
W76-08186

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, CANNED AND PRESERVED FRUITS AND VEGETABLES,
Environmental Associates, Corvallis, Oreg.
For primary bibliographic entry see Field 5G.
W76-08187

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE ORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08188

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE INORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08189

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES PETROLEUM REFINING INDUSTRY, PART 1, CHAPTERS -V.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08190

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, PETROLEUM REFINING INDUSTRY, PART 2, CHAPTERS VI - IX.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08191

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, THE PERMIT PROGRAM.
Energy and Environmental Analysis, Inc., Arlington, Va.
For primary bibliographic entry see Field 5G.
W76-08193

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, CONSTRUCTION GRANTS.
Touche, Ross and Co., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08194

AN ANALYSIS OF U. S. ENVIRONMENTAL PROTECTION AGENCY'S NEEDS SURVEY,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-08195

SOLID MINERAL AND REGENERANT RECOVERY FOR ION-EXCHANGE RESINS,
Aerojet-General Corp., El Monte, Calif. (Assignee).
For primary bibliographic entry see Field 3A.
W76-08199

STERILIZATION OF HOLDING TANKS AND TOILET BOWLS BY QUATERNARY COMPOUNDS,
Baylor Coll. of Medicine, Houston, Tex. (Assignee).
J. L. Melnick, and C. Wallis.
U.S. Patent No. w,941,696, 5 p, 4 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 339, March 2, 1976.

Descriptors: *Patents, *Waste water treatment, Water quality control, Water pollution control, *Water pollution treatment, Odor, Viruses, Bacteria, Fungi, Methane bacteria, Waste storage, Hydrogen ion concentration, *Sterilants.
Identifiers: *Quaternary compounds.

Wastewaters heavily laden with organic compounds and containing viruses and other microbiological flora are sterilized and maintained sterile for prolonged periods of time by the addition of a base, such as lime, and a quaternary compound, prferably cetyl pyridinium chloride, in amounts to maintain the pH of the wastewaters at about 9-11, or higher, and with sufficient quaternary compound for suspended solids present. This prevents the formation of methane gases, which are tentative hazards in that they are inflammable, asphyxiant and narcotic. Similarly, toilets are rendered sterile by the addition of the base and quaternary compound so that, upon flushing, aerosols generated will not contain active infectious agents. All bacteria and fungi are inactivated under these basic conditions by the addition of quaternary compounds. Viruses are also inactivated under these basic conditions but only with quaternary compounds which contain the pyridinium moiety. Products for and methods of sterilizing wastewaters are included and a number of examples are given. (Sinha - OEIS)
W76-08201

APPARATUS FOR CONTINUOUS DEWATERING OF AQUEOUS SUSPENSIONS,
Passavant-Werke, Michelbach (West Germany). Michelbacherhutte. (Assignee).
U. Stahl, O. Busse, H. Klesper, and W. Junker.
U.S. Patent No. 3,941,701, 4 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 341, March 2, 1976.

Descriptors: *Patents, *Waste water treatment, Water purification, Water quality control, Water pollution control, *Water pollution treatment, Filtration, *Dewatering, Filters, Sludge treatment.
Identifiers: Filter belt.

Apparatus for the continuous dewatering of aqueous suspensions such as slurries and sludges resulting from the purification of waste water is described. An endless filter belt has its upper flight passing through a feeding and initial partial dewatering zone while engaging a perforated backing sheet. The upper flight then passes through a main dewatering zone while being exposed to a positive pressure and/or a negative pressure. The backing sheet is provided with grooves, slots or similar passages which extend at an angle to the direction of travel of the belt and in closely spaced relation to one another so as to leave small strips on the backing sheet which support the filter belt. Due to this arrangement the passage of liquid through the sludge layer and the porous filter belt is greatly improved. Also, the friction caused by engagement of the filter belt with the strips extending between the grooves and/or slots serves to overcome the adhesion of liquid to the filter belt. A negative pressure is created at the underside of the filter belt due to movement of the belt over the edges of the strips. (Sinha - OEIS)
W76-08202

LIQUID CONDITIONING AND SETTLING TANKS,
R. P. Moore.
U. S. Patent No. 3,941,704, 4 p, 3 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 342, March 2, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water purification, *Settling basins, *Sludge, Sludge treatment, Flocculation, Separation techniques, Equipment.
Identifiers: Sludge blanket.

In liquid conditioning and settling tanks liquid to be treated is mixed with floc forming chemicals. The floc particles collect the impurities in the liquid leaving it clear. As the floc particles collect the impurities they become heavier and tend to settle to the base of the tank leaving clarified liquid which is drawn off at the top of the liquid. In such tanks a 'sludge blanket' is maintained in suspension in the lower portion of the tank by agitation in that portion. The sludge blanket serves to trap impurities, provides nuclei for the formation of new floc particles and is believed to aid to a certain extent the chemical reaction from which the floc particles result. The improvement of this invention is a sludge concentrating receptacle or sump within the lower portion of the tank defining a substantially quiescent zone in the tank. The receptacle or sump has an inlet lip above the base of the tank to receive sludge particles from the surface of the sludge blanket and an outlet for discharging concentrated sludge from the tank. The sump may include a well which tapers downward to a drain. (Sinha - OEIS)
W76-08203

PURIFICATION OF EFFLUENT,
Air Liquides Societe Anonyme Pour et L'Exploitation des Procedes, Paris (France). (Assignee).
P. Boulenger.
U.S. Patent No. 3,945,916, 4 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1905, March 23, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Water quality control, Water pollution control, Oxygenation, Activated sludge, Equipment, Effluents.

A process is described for the purification of effluent using an oxygen-rich gas in which the effluent is mixed with a biologically activated sludge. The effluent/sludge mixture thus obtained is oxygenated and then is introduced into a treatment zone in which a quantity of activated sludge is fixed on vertically-disposed, mobile discs immersed within the treatment zone and a further quantity of activated sludge is in suspension in the effluent undergoing treatment. The invention also relates to an installation for carrying into effect the process described. (Sinha - OEIS)
W76-08206

DECOLORIZING METHOD FOR WASTE KRAFT PAPER MILL EFFLUENTS,
Westvaco Corp., New York. (Assignee).
P. D. Foster.
U.S. Patent No. 3,945,917, 5 p, 4 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1905, March 23, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution effects, *Water pollution treatment, Water quality control, Water pollution control, *Pulp wastes, Fibers, Pulp and paper industry, Color, Hydrogen ion concentration, Barium, Effluents.
Identifiers: *Decolorization.

Considerable reduction in color of a kraft paper mill effluent has been found with the addition of barium ions (Ba+2) to the effluent. Unlike the familiar lime decolorization process for kraft paper mill effluents, decolorization using barium is substantially independent of the pH of the effluent and the color removing mechanism is in the form of an occlusion of the color bodies from the effluent into the barium sulphate precipitate (BaSO4) which forms from the sulphate (SO4) already present in or added to the effluent. The amount of decolorization produced by the process of the present invention depends upon the amount of sulfate ions in the effluent, the amount of barium ion containing material added to the effluent and the relationship of the amount of barium to the amount of sulphate in the effluent. A slight excess of sulphate over the stoichiometric equivalent of barium is desired, and the total amount of barium ion containing material and sulphate that must be added to the effluent depends on the initial color of the effluent and the degree of decolorization desired. (Sinha - OEIS)
W76-08207

PROCESS FOR THE ENVIRONMENTALLY FAVORABLE DESTRUCTION OF SOLID AND/OR LIQUID CYANIDE WASTE,
Deutsche Gold- und Silber-Scheideanstalt A. G., Frankfurt-am-Main (West Germany). (Assignee).
U. Schindewolf.
U.S. Patent No. 3,945,919, 3 p, 9 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1906, March 23, 1976.

Descriptors: *Patents, *Waste water treatment, *Chemical wastes, *Water pollution treatment, Water quality control, Water pollution control, Catalysts, Heat treatment, Pressure.
Identifiers: *Cyanides.

A process is described for destroying liquid or solid cyanide waste under environmentally favorable conditions consisting essentially of providing the cyanide with water in the presence of a salt of a transition metal as a catalyst and heating the aqueous mixture to a temperature of 120 deg to 200 deg C. at superatmospheric pressure to form ammonia and formic acid or a salt thereof. The process can take place continuously in a simple manner in a pressure tube, no poisonous waste products are formed, and the salts left behind accumulate in a highly concentrated form and therefore can be easily drawn off. (Sinha - OEIS)
W76-08208

ION-EXCHANGE GROUP BEARING COMPOSITE MEMBRANES,
Kanegafuchi Kagaku Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W76-08211

INNOVATIVE TECHNOLOGIES FOR WATER POLLUTION (ABATEMENT).
Water Purification Associates, Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-08220

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, URBAN RUNOFF.
Black, Crow and Eidsness, Ind., Atlanta, Ga.; and Jordan, Jones and Goulding, Inc. Atlanta, Ga.
For primary bibliographic entry see Field 5G.
W76-08222

OXIDATION DITCH TREATMENT OF MEAT PACKING WASTES,
Iowa Univ., Iowa City. Dept. of Civil (Environmental) Engineering.
W. L. Paulson, D. R. Kueck, and W. E. Kramlich.
(Water Pollution Control Research Series 12060---03/71). Presented at 2nd National Symposium on Food Processing Wastes, March 1971. p 617-635, 3 fig, 5 tab, 6 ref. EPA 12060 EUB.

Descriptors: *Food processing industry, *Waste water, Treatment, *Activated sludge, Industrial wastes, *Oxidation lagoons, Operations, Treatment facilities, Performance, Aeration.
Identifiers: *Meat packing wastes, *Oxidation ditch.

The design and early operation of a 3.25 mgd channel aeration activated sludge wastewater treatment plant are described. The plant treats the wastewater from the hog and beef meat packing plant of John Morrell and Co., Ottumwa, Iowa. The plant includes pre-aeration, primary settling and grease removal,and treatment in two aeration channels (40ft wide X 6 ft deep) in parallel. The overall length is 1050 ft. The aeration channels utilize rotor and floating aerators. One channel utilizes an experimental straightline settling unit (16ft X 475 ft X 6 ft deep). The plant has experienced considerable operational difficulties with solids removal via tubular conveyors in primary units, rotor and floating aerators and in the straightline settling unit. Initial performance data indicate that the plant will meet an effluent BOD5 value of 75 mg/l or less with alterations in aeration capability and sedimentation unit changes. Plant modifications are being developed. Experimental animal feeding studies with recovered waste activated sludge will be conducted. (EPA-Corvallis)
W76-08223

ACID COAGULATION AND DISSOLVED AIR FLOTATION,
Meat Industry Research Inst., Wellington, (New Zealand).
B. H. P. Wilkinson.
Presented at Research Conference on Meat Industry of New Zealand, 1971, V. 225, p 52-53.

Descriptors: *Food processing industry, Industrial wastes, *Waste water treatment, *Flotation, *Coagulation, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Coliforms.
Identifiers: *Meat-packing wastes, Acid coagulation, Dissolved air flotation.

Dissolved air flotation is used in the process of extracting acid-coagulated proteinaceous material, fat and other surface active materials from meat processing plant effluent. The protein is precipitated at its iso-electric point, pH 4.0-4.5, which increases the floc size and makes the proteins more amenable to removal by dissolved air flotation. Pilot plant studies have evaluated the process with respect to suspended solids (SS), COD, BOD, and coliform reduction. Removals were 85-95 percent SS, 70-80 percent COD and BOD, and greater than 99 percent coliforms. (EPA-Corvallis)
W76-08224

USE OF CRUSHED LIMESTONE TO NEUTRALIZE ACID WASTES,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5G.
W76-08225

OXYGEN RELATIONSHIPS IN A SOIL TREATED WITH SEWAGE EFFLUENT,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
S. D. Klausner, and L. T. Kardos.
Journal of Environmental Quality, Vol. 4, No. 2, p 174-178, April/June, 1975. 1 fig, 4 tab, 15 ref. OWRT B-001-PA(11), 14-01-001-837.

Descriptors: *Soil analysis, *Sewage disposal, *Effluents, Aeration, Oxygen, Ammonium, Nitrogen, Irrigation.
Identifiers: *Land application, Oxygen diffusion rates.

The effects of applying chlorinated, secondary sewage effluent on two aeration parameters, oxygen diffusion rate and concentration of oxygen in the soil gas, were studied. The effects of applying the sewage effluent on several chemical parameters which may be affected by differing aeration conditions, notably, the concentrations of NH4+, NO3-, and NO2- nitrogen, and iron and manganese in the soil water, were also evaluated. Water samples and oxygen diffusion and concentration measurements were taken on a weekly basis from a loamy field watered with secondary treated sewage effluent during a four-year rotation of oats, hay and corn. The concentration of nitrogen, iron, and manganese was analyzed weekly from the soil water samples. As weekly application of effluent changed from 0 cm to 2.5 cm to 5.1 cm, average gaseous oxygen concentrations to a depth of 46 cm ranged from 19.6 to 19.0 to 18.4%. Oxygen diffusion rates (ODR) were not significantly different for the three effluent levels but values diminished with depth with a minimum of 15 at 46 cm and a maximum of 27 at 8 cm. Gaseous oxygen concentration was not affected by crop cover but ODR was less under hay than under corn. Water samples obtained at depths of 15.2 and 61 cm showed that nitrite levels were very low. Ammonium-N levels were greater in the 5.1 cm effluent treatment but there were no differences due to vegetation cover or soil depth. Manganese and iron levels were not affected by effluent treatment. The weekly 5.1 cm application of sewage effluent did not degrade the aeration condition of the soil. (Loustau-FIRL)
W76-08231

UNDERGROUND DETENTION FOR STORM OVERFLOWS.
For primary bibliographic entry see Field 8G.
W76-08234

SAFEGUARD FLUID-HANDLING EQUIPMENT WITH PIPELINE BASKET STRAINERS,
Hayward Mfg., Co., Inc., Elizabeth, N. J.
For primary bibliographic entry see Field 8G.
W76-08235

POLYETHYLENE PIPE SOLVES PROBLEM OF FORCE MAIN SEWER LINE INSTALLATION ACROSS INLAND WATERWAY.
For primary bibliographic entry see Field 8F.
W76-08236

HALF-SECTION PIPE USED EFFECTIVELY,
For primary bibliographic entry see Field 8F.
W76-08237

ABOUT THE PROBLEM OF DIRECT RUNOFF DETERMINATION BY SEPARATION OF THE HYDROGRAPH COMPONENTS (K OTAZKE URCENIA PRIMAEHO ODTOKU SEPARACIOU PRIETOKOVYCH VLN),
For primary bibliographic entry see Field 2A.
W76-08238

FAST REPLACEMENT OF A FLOOD-DAMAGED INTERCEPTOR,
Metropolitan Denver Sewage Disposal District No. 1, Commerce City, Colo.
For primary bibliographic entry see Field 8F.
W76-08240

COMBINATION SEWAGE TREATMENT AND COOLING SYSTEM,
Cherne Industrial, Incorporated, Edina, Minn. (Assignee).
L. J. Boler.

Descriptors: *Sewage treatment, *Conduits, *Cooling, Aeration, Sewage, *Patents, *Waste water treatment, Evaporation control, Settling basins.
Identifiers: Settling tanks.

A sewage treatment and cooling system has been patented. The system includes a sewage treatment conduit in which liquid sewage is conveyed along an extended continuous loop or recirculating path, with means for introducing additional sewage at a minimum of one point along the conduit, and with means for feeding at least a portion of the liquid from the conduit through the cooling condensers of an operating plant and back into the sewage treatment conduit. Propulsion and treating means are included for maintaining a minimum rate of flow in the conduit to prevent settling of solids and to aerate the liquid. A plant cooling system pumping means serves as one propulsion means for moving the liquid through the conduit. Liquid in the conduit is aerated both to cool it for reuse in the cooling system and to achieve oxygen enrichment which will promote the desired sewage treatment. Liquid is removed from the sewage treatment conduit to settling tanks at a rate equal to the rate of incoming flow of sewage, less evaporation and other losses. (Sandoski-FIRL)
W76-08242

LAKE MICHIGAN GETS HELP,
Milwaukee Sewerage Commission, Wis.
R. D. Leary, and D. T. Lundy.
Water and Wastes Engineering, Vol. 10, No. 9, p 64-67, September, 1973. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Water pollution control, *Treatment facilities, Storm runoff, Lake Michigan, Sewage, Aeration, Chlorination, Conduits, Effluents, Outlets, Pipelines, Outfall sewers, Wisconsin, Phosphorus, Lakes.
Identifiers: *Phosphorus removal, Modernization, Milwaukee(Wisc).

Expansion and modernization of two waste water plants is helping Milwaukee, Wisconsin, protect the waters of Lake Michigan. Unique features at the Jones Island plant include fine and coarse screening instead of primary settling basins, the use of waste pickle liquor for effective phosphorus removal at almost negligible cost, and sludge disposal by production of a commercially-marketed fertilizer under the name Milorganite. Included in the modernization project is the use of waste heat from the generators to aid in the drying process of Milorganite production. The South Shore plant capacity is rated at 120 mgd but provisions have been made to accomodate three times this flow through the treatment process with bypassing of sewage into the lake. Aeration basins are designed for conventional and step aeration, the final settling basins are octagonal in shape, plant units are arranged to provide for any quarter of the plant to be isolated and operated independently in times of storm flow or for experimental purposes, and chlorination of the effluent is effected in the outfall conduit with the necessary detention time being provided in the 132-inch pipeline extending approximately 2000 feet into Lake Michigan to a water depth of 25 feet. (Sandoski-FIRL)
W76-08246

REGIONAL AGENCY STARTS UP PHYSICAL-CHEMICAL TREATMENT PLANT.
Environmental Science and Technology, Vol. 7, No. 9, p 804-805, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Treatment facilities, Sewage, Filters, Filtration, Suspended solids, Ion exchange, Adsorption, Tertiary treatment, Clarification, Chemical precipitation, Minnesota.
Identifiers: Rosemont(Minn), Ammonia removal, Physico-chemical treatment, Dual media filters.

A $2 million advanced waste water treatment plant at Rosemount, Minnesota, is nearing completion under the supervision of the Sewer Board System. The plant is designed for a 600,000 gpd average capacity with sizable expansion possible. Raw sewage enters the plant through a one-inch bar screen that removes large objects and trash. After flowing by gravity through a common flume into a wet well, the sewage is divided into two separate treatment trains. The first process component in each train is an Ecodyne Reactivator clarifier which uses lime to precipitate phosphates as calcium phosphate. After clarifier retention of four hours, effluent pH is lowered from 11 to 8.5 before entering four ecodyne Graver Monoscour filters (two filters handle each section of the stream). The dual media filters reduce inorganic and organic suspended solids to 3-5 ppm in filtered effluent. After filtration, the effluent is pumped to a filtered water holding tank, water is pumped to six carbon adsorption tanks, three on each stream, for removal of dissolved organics. The effluent then enters a secondary set of four Ecodyne Monoscour filters to remove fine solids, flows to another holding tank and then into an ion exchange vessel for ammonia removal. Effluent from the ion exchange system, the last treatment step, is discharged from the plant with less than one ppm ammonia nitrogen. (Sandoski-FIRL)
W76-08248

ECONOMICAL FOAM CONTROL IN WASTEWATER TREATMENT SYSTEMS,
Nalco Chemical Co., Chicago, Ill.
J. A. Hyde.
Water and Sewage Works, Vol. 120, No. 8, p 56-57, August, 1973. 3 fig.

Descriptors: *Waste water treatment, *Automatic control, Electrodes, Aeration, *Foaming, Control systems.
Identifiers: Antifoam feed system, Chemical feed rate, Aeration basins.

Excessive foam in the aeration basin of a waste water treatment plant can interfere with oxygen uptake of the microorganisms and inhibit BOD reduction. An automatic antifoam feed system in which the system senses changing demand for anti-foam and adjusts the chemical feed rate has been developed for use with aeration basins. The foam probe system is controlled by a sensing electrode that detects the level of foam by conductivity. The sensing electrode is installed in the foaming system at the maximum desired foam height. The foam probe system operates by feeding a small amount of antifoam continuously from a base load pump and additional antifoam from an automatically controlled surge pump. The surge pump is activated only when foam touches the foam sensing electrode. (Sandoski-FIRL)
W76-08249

'WE'VE FOUND A REAL TIME-SAVER',
Mansfield Sewage Treatment Plant, Ohio.
For primary bibliographic entry see Field 8C.
W76-08251

DERIVATION OF A MODEL RAIN FOR THE DIMENSIONING OF SEWER SYSTEMS (ENTWICKLUNG EINES BERECHNUNGSREGENS FUER DIE BEMESSUNG VON KANALNETZEN),
V. Sifalda.
Gas- und Wasserfach, Wasser/Abwasser, Vol. 114, No. 9, p 435-440, 1973. 3 fig, 4 tab, 7 ref.

Descriptors: *Model studies, *Rainfall, *Sewerage, Rainfall intensity, Design, Combined sewers, Precipitation(Atmospheric).
Identifiers: Czechoslavakia.

Model rainfall for the dimensioning of mixed sewer systems has been derived from time analyses of heavy rainfalls in Prague, Pilsen, and Brno to obtain the loading of the sewer system due to rainfall preceding the main period of precipitation. Rainfall with an initial peak period occurring within the first half of the total duration was predominant; rainfalls with uniform and non-uniform intensity distributions were found to be equal frequency. The rainfall profile, composed of three sections, includes: the initial rainfall period with 25 percentof the average intensity of the precipitation period and of the same duration as the latter; a second phase of the precipitation period; and, a final rainfall period. (Nave-FIRL)
W76-08253

TOWN HALTS INFILTRATION.
Water and Wastes Engineering, Vol. 10, No. 10, p 47, October, 1973.

Descriptors: *Sewerage, *Infiltration, Groundwater, Manholes, Repairing, Treatment facilities, Design criteria, Cements, Joints(Connections), Pipelines, Hydraulics, Georgia.
Identifiers: St. Simons Island(Ga), Hydraulic loading, Sewer repair.

Renovation of sewer lines and manholes cut infiltration 1.1 mgd at peak loading in a Georgia community. In early 1971, the sewage treatment at St. Simons Island was being subjected to peak loadings of more than two mgd by groundwater infiltration through leaking collector lines and deteriorated manholes and catch basins. Work was begun in March 1971 with Southern Line crews assigned to clean, televise, and repair more than six miles of sewage collection lines and renovate 62 deteriorated manholes, the latter accomplished by the use of special cement formulas and techniques developed by Southern Line research. Since project completion, hydraulic loading on the treatment facility has diminished from peak values of over two million gpd to values peaking at 900,000 gpd. Also, sand infiltration has noticeably been decreased as indicated by grit chamber loading. According to current design criteria, an additional 2000 customers can be added to yield a maximum loading hydraulically of 1.5 mgd. This would mean a prospect of doubling the present loading which could result in a minimum increase in revenue of $9500 per month in accord with their present rate structure. (Sandoski-FIRL)
W76-08257

APPARATUS FOR FLUSHING SEWERS,
A. A. Lemke.
Canadian Patent 934,636. Issued October 2, 1973. Patent Office Record, Vol. 101, No. 40, p 3217, October 2, 1973.

Descriptors: Equipment, *Sewers, Manholes, Flow, Sewerage, *Patents, Outlets, Solid wastes, Tanks, *Waste water treatment.
Identifiers: Sewage accumulation tank.

A method and the equipment to create a periodic flow of aqueous wastes which will eliminate any settled solids accumulated from sewers and manholes has been patented. The system consists of a sewage accumulation tank positioned in a manhole which communicates with its liquid sump at a level below that of the outlet sewer conduit. The tank is adapted with vacuum means to induce the flow of sewage into the accumulation tank and with means to introduce air into the tank which will eliminate the vacuum and release the accumulated sewage rapidly to join with the normal sewage flow. This will produce a flushing surge of liquid flowing in the sewer condut. (Sandoski-FIRL)
W76-08262

SEWAGE CLEANED WITH COAL,
Materials Reclamation Weekly, Vol. 123, No. 11, p 21, September 15, 1973.

Descriptors: *Sewage treatment, *Coals, Heavy metals, Sewage, Lead, Zinc, Copper, Chromium, Cadmium, Mercury, Toxicity, *Canada, *Waste water treatment.
Identifiers: *Heavy metal removal.

A method of removing toxic heavy metals from sewage by using coal is being developed at the University of British Columbia in Canada. In this system, sewage passes over a bed of low-grade lignite coal which attracts heavy metals such as lead, zinc, copper, chromium, cadmium, and mercury. Almost 100 percent clearance of these metals has been achieved. It is estimated that the whole sewage flow of Iona Island, Vancouver, 70 mgd, could be treated with coal. This would require 700 tons of low grade coal crushed into 1/4-inch particles and spread in an 8-inch thick bed over an area of more than an acre. Such a bed could be used efficiently for at least 200 days. Its cleaning properties could then be restored by washing with a weak solution of nitric acid to dissolve the metals attracted by the coal. (Sandoski-FIRL)
W76-08263

NEW AUTOMATION IMPROVES SACRAMENTO WASTEWATER CONTROL,
Instrumentation, Vol. 26, No. 2, p 7-11, 1973. 3 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Automatic control, Filters, Control systems, Equipment, Sludge treatment, Clarification, California, Automation.
Identifiers: Sludge handling, Clarifiers, Sacramento(Calif).

Recent expansion of the Sacramento, California, main waste water treatment facility included the addition of a secondary stage. Improvements consisted of increased headworks capacity, biological filters, secondary clarifiers, and the latest types of automatic control instrumentation. New instrumentation includes Vutronik solid-state electric miniature indicator controllers in the sludge-handling control room and Vutronik recorders in the main control room. All instrumentation was furnished by Honeywell under a subcontract for supervision services during installation and commissioning of the control systems. (Sandoski-FIRL)
W76-08264

EMERGENCY EQUIPMENT UTILIZATION KEEPS EFFLUENT CLEAN,
Water and Sewage Works, Vol. 120, No. 9, p 120-121, 4 fig. September 1973.

Descriptors: *Treatment facilities, *Waste water treatment, *Activated sludge, Biochemical oxygen demand, Sludge, Effluents, Florida, Electrical equipment.
Identifiers: Pensacola(Fla), Emergency equipment, Caterpillar natural-gas engine.

The City of Pensacola, Florida, has developed an emergency system to eliminate problems in the case of power failure or equipment downtime. Under the jurisdiction of the Sewage Treatment Division are five treatment plants and 63 pumping stations scattered around the franchised area. These five plants have a total capacity of 110.5 mgd. At the Central Plant, which treats about 9.0 mgd of the total volume, treatment is by the activated sludge method which yields a better than 90 percent reduction in BOD. Primary power for each of the three 10,000 cfm mechanical blowers is a Caterpillar natural-gas engine. At full plant capacity, something less than two of these engines are necessary for complete treatment. Pensacola installed three engines; one of which is always on standby. In addition, two 5000cfm electric blowers were installed. To keep necessary electric gear

functioning in case of an outage, a 190 kw Caterpillar standby generator was installed with the natural gas engines. The total effect of the treatment process has been to reduce BOD by at least 90 percent from an input strength of between 200 and 360 mg/liter, making the effluent to Pensacola Bay within safe limits. Also, the solids content of the input waste, about 0.1 percent, has been separated and concentrated to the three percent level of the digested sludge. (Sandoski-FIRL)
W76-08265

ZERO EFFLUENT SYSTEM.
Products Finishing, Vol. 37, No. 9, p 129, June, 1973. 1 fig.

Descriptors: *Industrial wastes, *Waste water treatment, *Automatic control, Liquid wastes, Solid wastes, Sludge treatment, Landfills, Centrifugation, Clarification, Control systems, Illinois.
Identifiers: Rock Island Arsenal(Ill), Plating wastes, Zero discharge.

Plating wastes from Rock Island Arsenal, Illinois, are treated in a closed-loop totally automatic system designed by the Arsenal and DMP Corporation of Charlotte, North Carolina. All liquid and solid wastes are reclaimed, reducing water consumption by 54,000 gallons per year and water cost from 45 to 30 cents per 1000 gallons. The system processes 225,000 gallons per day, with zero discharge. Sludge from the clarifier is centrifuged, solids are calcined, and ash is used for landfill. All phases of the system are automatically controlled, with alarms sounding when operational parameters are violated. (Sandoski-FIRL)
W76-08267

EFFICIENT CHEMICAL METHOD FOR THE TREATMENT OF ZINC MANUFACTURING PLANT GENERATED WASTE WATERS (EFFEKTIVNYY KHIMICHESKIKH SPOSOB OCHISTKI STOCHNYKH VOD TSINKOVOGO ZAVODA),
V. A. Sedova, and B. I. Kogan.
Tsvetnyye Metally, No. 4, p 53-54, 1973. 1 tab.

Descriptors: *Industrial wastes, *Effluents, Lime, Calcium chloride, Chlorine, *Zinc, Cadmium, *Waste water treatment.
Identifiers: Chemical treatment, Metal removal.

A chemical process for the removal of zinc and cadmium from zinc smeltery generated effluents was tested in scale-up experiments. In the first stage of treatment, the effluent was treated with slaked lime (210 gallons/liter) to adjust the pH value to 9-9.5, and then settled for two hours. The water from the first stage was decanted into a second stage reactor in which, under intense agitation, it was subsequently treated with calcium chloride solution (500/g/liter) and soda ash solution (100/g/liter) and then settled for four hours for the coprecipitation of zinc, cadmium, and calcium carbonate. While this treatment procedure entails increased mineral and chlorine ion contents in the treated water, the latter can be recycled within the manufacturing process provided the use of calcium chloride is not necessary. This method has proved efficient in the removal of manganese, iron, lead, strontium, and in part, of aluminum, silicon, and titanium from the effluents. (Takacs-FIRL)
W76-08268

CHEMFIX TREATMENT SYSTEM FOR LIQUID AND SLUDGE EFFLUENTS.
Materials Reclamation Weekly, Vol. 122, No. 20, p 26, May 19, 1973.

Descriptors: *Industrial wastes, *Sludge, Waste water treatment, Sludge treatment, Heavy metals, Lagoons, Storage tanks, Toxicity, Steel, Chemical industry.
Identifiers: Chemical reagents, Steel industry, Metal finishing industry.

A process for transforming certain industrial toxic liquid and sludge wastes into a harmless, soil-like substance which can be returned to the land, has been developed under the name of Chemfix. At its present development stage, Chemfix is limited to wastes with a high inorganic content. Each type of waste needs careful analysis to determine if it is suitable for treatment. Among areas for which the process is strongly applicable are sections of the steel, metal finishing, and chemical industries giving rise to liquids and sludges with heavy metal concentrations. In this process, wastes are pumped from lagoons or storage tanks into a Chemfix mobile processing plant housed in a 40-foot road trailer. Chemical reagents are introduced to the waste which is then pumped from the plant to settle on the ground. Within one to three days the treated sludge becomes an inert, earth-like solid, which is nontoxic and non-polluting. (Sandoski-FIRL)
W76-08269

WASTE WATER RECYCLED FOR USE IN REFINERY COOLING TOWERS,
Mobil Oil Corp., East Chicago, Ind.
J. A. Hart.
Oil and Gas Journal, Vol. 71, No. 4, p 92-96, June 11, 1973. 3 fig, 3 tab.

Descriptors: *Waste water treatment, *Water reuse, Flotation, *Cooling towers, Pollution abatement, Effluents, Lake Michigan, *Recycling, Organic compounds.
Identifiers: Refineries.

Mobil Oil Corporation's East Chicago, Indiana, refinery has been reusing water in various ways for more than 30 years. Water supply for the refinery is taken from the Indiana Harbor Canal which flows into lower Lake Michigan. Although quality of this water is rather poor, it is the only source of input water at this refinery. Sulfides and ammonia are removed from process waste water in a sour water stripper. A dissolved air-flotation unit removes oil and suspended solids. Treated waste water is then reused for cooling tower makeup while cooling tower blowdown is used for pump-gland cooling systems. Stripped sour water is reused as crude-desalter wash water. Water contamination has been minimized and pollutants discharged to the Indiana Harbor Canal have been reduced. Several new sources of waste water for reuse have been developed. Six minor refinery-effluent discharge streams were eliminated, leaving only one process water outfall. Ballast water is piped into two 10,000 bbl holding tanks; the oily water is discharged continuously into the API separator and air-flotation units thus becoming a part of the waste water used as cooling tower makeup. A permanent well point system is operated adjacent the dock bulkhead to maintain groundwater at a level slightly below canal water level and to prevent hydraulic damage to the bulkhead. (Sandoski-FIRL)
W76-08270

CYANIDE TREATMENT IN THE METAL FINISHING INDUSTRY,
K. R. Coulter.
Canadian Mining Journal, Vol. 94, No. 6, p 33-34, June, 1973.

Descriptors: *Industrial wastes, Oxidation, Carbonates, Nitrogen compounds, Suspended solids, Filtration, Iron, Calcium, *Waste water treatment.
Identifiers: *Cyanide, Catalytic oxidation, Carbon copper, *Metal finishing wastes.

A new process for cyanide treatment in the metal finishing industry is catalytic oxidation with carbon copper. The Calgon company produces and is marketing equipment in which Cu is introduced as a catalyst and mixed with the cyanide waste stream. This mixture is then passed through an oxygen bearing gas which after mixing is passed through a carbon tower. The ratio of CN (-) to O2 to Cu is 1:1:1 by weight in the solution and complete destruction to carbonate and nitrogen compounds occurs in about 25 minutes. A piece of equipment for treating about 50 gpm, costs $25,000 and can be prepared to engineering specifics. Limitations are that Fe and Ca will interfere and suspended solids above 50 ppm must first be filtered out. (Sandoski-FIRL)
W76-08271

CANADIAN MILLING PRACTICE FOR WATER RE-USE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Mineral Processing Div.
D. E. Pickett.
Canadian Mining Journal, Vol. 94, No. 6, p 29-30, June, 1973. 1 tab.

Descriptors: *Water reuse, *Surveys, Mine wastes, Mining, Suspended solids, Overflow, Flotation, Mills, *Canada, Reviews, Industrial wastes, Gold, Zinc, Copper, *Recycling, *Waste water treatment.
Identifiers: Environmental protection, Colloidal slimes.

A survey of water recycling practices in Canadian mills gathered facts from which research requirements could be planned, informed mill superintendents of practices at other plants, and presented a picture of the efforts and progress of the industry in meeting environmental protection demands. Of seven gold mines reporting, four indicated no recycling. Operating conventional cyanide circuits with zinc precipitation, all recycle some barren solution if only to conserve cyanide. In 85 percent of the copper tonnage, an average of 76 percent of the water is recycled. Scarce water at many copper mine sites is a big factor but other plants utilizing fresh water also recycle successfully. Except for two of the mine mills reporting, nickel-copper mills recycle all water used. The other mills reclaim water from a controlled lake system with no release to the natural surface-water system. Advantages claimed are possible reagent and heat savings. Problems are caused by suspended solids, particularly in thickener overflow water, pump glands, and heat exchangers. Hardness and colloidal slimes cause flotation control problems mainly due to variability. Twenty-five percent of the iron mines, all concentrating magnetite, report: no problems at one, although hardness and low pH indicate a fairly high sulfate content; at a second, recycling from a thickener with only 110 minutes retention time, problems with suspended solids and colloidal material requiring lime and flocculant; and, of a third mine, recycling from a single large pond with 70 days retention, no suspended solids or pipeline problems. (Sandoski-FIRL)
W76-08272

A NEW SEWAGE TREATMENT TECHNIQUE FOR THE PURPOSE OF NITROGEN ELIMINATION (I): BIOLOGICAL DENITROGENIZATION OF URBAN SEWAGE (CHISSO JOKYO O MOKUTEKI TO SHITE ATARASHII GESUI SHORI GIJUTSU (I),--TOSHI GESUI KARA NO SEIBUTSUGAKUTEKI DATSU CHISSOHO NI TSUITE),
Ebara Infilco, Tokyo (Japan).
Y. Toya, Y. Matsuo, and T. Suzuki.
Yosui to Haisui, (Water and Waste) Vol. 15, No. 9, p 26-42, September, 1973. 12 fig, 2 tab, 26 ref.

Descriptors: *Sewage, *Biological treatment, *Denitrification, Nitrogen, Pilot plants, Laboratory tests, Sewage treatment, Municipal wastes, Tanks, Organic matter, *Waste water treatment.
Identifiers: Nitrogen removal.

Various methods of biological denitrification of urban sewage were investigated by laboratory experiments and a pilot plant study between

November 1971 and February 1973. Application of the treatment to urban sewage was firmly and clearly demonstrated. The Wuhrmann method, the Bringmann method, and the new process developed by Ludzack and Ettinger were examined. Results indicate that the Bringmann method leaves some untreated NH and N in sewage. Therefore, the mixed liquid in the nitrification tank was fed to the first denitrification tank where sewage was contacted and completely denitrified. The liquid then was fed into the nitrification tank and remaining NH3-N oxidized. Finally the liquid passed into the secondary denitrification tank where the Wuhrmann method was applied. The elimination rate of nitrogen was found to be more than 90 percent without a methanol additive. This new method appears particularly effective in the treatment of organic wastes. (Seigle-FIRL)
W76-08274

A CONTINUOUS METHOD OF MONITORING WATER QUALITY BY CHLORINE CONSUMPTION UNDER ULTRAVIOLET RADIATION. I. DESIGN AND PERFORMANCE TEST OF CONTINUOUS CHLORINE CONSUMPTION METER AND APPLICATION TO RAW WATERS OF A WATER PURIFICATION PLANT, (IN JAPANESE),
For primary bibliographic entry see Field 5A.
W76-08276

A THEORETICAL STUDY OF FACTORS INFLUENCING THE MICROBIAL POPULATION DYNAMICS OF THE ACTIVATED-SLUDGE PROCESS-II. A COMPUTER-SIMULATION STUDY TO COMPARE TWO METHODS OF PLANT OPERATION,
Water Pollution Research Laboratory, Stevenage (England).
C. R. Curds.
Water Research, Vol. 7, No. 10, p 1439-1452, 1973. 9 fig, 1 tab, 2 ref.

Descriptors: *Model studies, *Treatment facilities, Computer models, Sludge, Sewage, Effluents, Bacteria, *Activated sludge, Microorganisms, *Waste water treatment, Suspended solids.
Identifiers: Debris, Population dynamics.

Computer simulations were performed to investigate the effects of operating a plant with a constant sludge-wastage rate and with a constant concentration of mixed-liquor solids. Theoretically, if any sewage parameter is not completely stable, then a slightly better quality effluent should be achieved when the plant is operated with a constant specific wastage rate. In practice, however, the slight improvement is not usually measurable. The effects of a sudden stable increase (a slug dose) of sewage substrate and bacterial content on the plants operated in the two ways studies have been simulated; diurnal variations in sewage flow, and in concentrations of bacteria, debris, and substrate in the sewage were considered. (See also W74-02996) (Sandoski-FIRL)
W76-08277

DEVELOPMENT OF ASSYMMETRIC CELLULOSE TRIACETATE MEMBRANES FOR SEA-WATER DESALINATION,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
For primary bibliographic entry see Field 3A.
W76-08283

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS SEA WATER DESALTING PLANTS, DESIGN OF 1-10 MGD SEAWATER PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08284

MORRELL PIONEERS MORE EFFICIENT AERATION,
John Morrell and Co., Ottumwa, Iowa.
G. E. Ahrens.
Reprint, Food Engineering, August 1969. 3 p, 1 fig.

Descriptors: *Food Processing Industry, *Waste water treatment, *Activated sludge, Iowa, Industrial wastes, *Oxidation lagoons, *Design, *Operations, *Treatment facilities, Performance.
Identifiers: *Meat packing wastes, *Oxidation ditch.

The design and proposed operation of a 3.25 mgd channel aeration activated sludge wastewater treatment plant are described. The plant is designed to treat hog and beef meat packing wastes from the John Morrell and Co. plant in Ottumwa, Iowa. Design details, unit sizes and features are described and predicted performance is summarized. (EPA-Corvallis)
W76-08286

THE INFLUENCE OF SOILS AND PLANT COVER ON THE RETENTION AND UTILIZATION OF SUSPENDED AND DISSOLVED MATERIALS IN THE WASTE WATER OF A POULTRY PROCESSING PLANT,
Clemson Univ., S. C. Dept. of Agricultural Chemical Services.
N. R. Page.
August 1971. 21 p, 1 fig, 5 tab.

Descriptors: *Food Processing Industry, *Waste water treatment, Return flow, Soil analysis, Agriculture, Agronomy, Industrial wastes, Poultry, Soil chemical analysis.
Identifiers: *Poultry processing industry, Spray irrigation.

Poultry processing plant effluent is characterized with respect to chemical elements prior to spray irrigation, the chemical composition of ground cover (reed canarygrass) is determined, and the soil is characterized. The wastewater is applied at the rate of 3.6 million gallons per 100 acres. It was analyzed for K, Ca, Mg, Na, N, NO3, P, S, Cl, and pH. Sodium concentration (105 mg/l) is double that of the next highest element, nitrogen. Source of Na is blood and detergents; the nitrogen exists mainly in the organic form (suspended animal matter). For the reed canarygrass composition, the N and P concentrations were nearly double the published values, thus making the canarygrass a good food source. Removals from the wastewater by plant uptake ranged from 25 percent for K to 0.5 percent for Na. Soil analysis found that the system increased the organic matter, cation exchange capacity, and Ca, K, Na, S and P concentrations, and decreased the Mg concentration within the 0-4 foot depth of the soil. Most of the Na, Cl, and nitrates leach into the groundwater. P and S added at the present rate can be fixed and/or absorbed by the soil for a 50 year period. (EPA-Corvallis)
W76-08287

NEW APPROACHES POINT TO BETTER ECONOMIES IN HIDE PROCESSING,
For primary bibliographic entry see Field 3E.
W76-08288

COAGULATION WITH CHITOSAN - AN AID TO RECOVERY OF BY-PRODUCTS FROM EGG BREAKING WASTES,
Georgia Univ., Experiment. Div. of Food Sciences.
W. A. Bough.
(1975). 21 p, 8 tab, 16 ref.

Descriptors: *Food processing industry, *Coagulation, Flocculation, Flotation, Polymers, By-product, Amino acids, Waste water treatment, Poultry, Industrial wastes.
Identifiers: *Egg Products Plant, Coagulant aids, *Chitosan, Dissolved Air Flotation.

Egg breaking wastes were treated with 100-200 mg/l chitosan, a by-product derived from shrimp and crab shells, and 2-20 mg/l Betz 1130. Suspended solids in the wastewater were reduced by 70-90% and the COD by 55-75%. The yield of dry coagulated solids from wastes collected during cleanup was approximately 12 lb./1000 gal., and from the concentrated wastes in the egg washers, the yield was approximately 40 lb./1000 gal. The estimated polymer cost for coagulation of the egg washer wastes was $0.80/1000 gallons. The amino acid composition of five samples of coagulated egg by-products approximated closely the composition of whole eggs. The value of the coagulated solids and the savings in waste treatment charges may encourage segregation and treatment of concentrated egg breaking wastes. (EPA-Corvallis)
W76-08289

BIOLOGICAL CHANGES IN THE SOUTH ST. PAUL SEWAGE TREATMENT PLANT BEFORE AND AFTER TREATMENT WITH FECL3 AND NALCOLYTE 675 COAGULATING AGENTS,
Saint Cloud State Coll., Minn. Dept. of Biology.
K. M. Knutson.
September 10, 1970. 23 p, 3 fig, 4 tab, 4 ref, 11 plates.

Descriptors: *Food processing industry, Waste water treatment, *Coagulation, Flocculation, Trickling filters, Anaerobic digestion, Polyelectrolytes, *Microorganisms, Algae, Bacteria, Oxidation lagoons, Industrial wastes, Minnesota, Eutrophication, Settling basins, *Sewage treatment.
Identifiers: *Meat-packing wastes.

Results are presented of analyses of trickling filter microorganisms anaerobic stabilization pond bacteria, and anaerobic stabilization pond algae at the South St. Paul sewage treatment plant before and after primary treatment with FeCl3 and Nalcolyte 675 coagulating agents. The plant treated combined municipal and slaughterhouse wastes. For the trickling filter, no significant change was found in the association of species with respect to number of species and dominance. Each species did appear in greater quantity after treatment. For the anaerobic stabilization pond, the number of bacteria increased after treatment by a factor of 5 to 18 depending on sample location. This increase was considered beneficial. For the anaerobic stabilization pond, algae fluctuations were considered minor and represented only a 1.7 fold increase after treatment. One period did show an algal bloom which resulted in a 140 fold increase. A possible cause was the cessation of slaughtering operations by Swift and Co. resulting in a lower BOD, thus stimulating algal growth. The increased growth of microorganisms, algae, and bacteria is beneficial and hastens the utilization and decomposition of non-refractory organic matter. (EPA-Corvallis)
W76-08290

WASTEWATER CONTROL AT EGG PRODUCTS PLANTS, PT. 1-3.
Poultry and Egg Inst. of America, Washington, D.C.
For primary bibliographic entry see Field 3E.
W76-08291

WASTES FROM THE POULTRY PROCESSING INDUSTRY,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 3E.
W76-08292

DESIGN AND PERFORMANCE OF PHYSICAL-CHEMICAL AND ACTIVATED SLUDGE TREATMENT FOR AN EDIBLE OIL PLANT,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.

C. E. Adams, J. J. Joseph, T. Walsh, and R. M. Stein.
Presented at 30th Annual Purdue Industrial Waste Conference Purdue University, West Lafayette, IN, May 6-8, 1975. 20 p, 7 fig, 5 tab.

Descriptors: *Food processing industry, *Waste water treatment, Separation techniques, Flotation, Oxidation lagoons, Aerobic treatment, Aeration, *Activated sludge, Design data, Industrial wastes, Design, Performance, Oil wastes.
Identifiers: *Edible oil refinery, API separator, Dissolved air flotation.

A waste treatment system was designed and constructed for an edible oil (vegetable) refinery and an in-plant waste management program was developed. Pilot-scale activated sludge studies were performed in order to obtain design parameters for the secondary system. The reaction rate coefficient, k, was determined to be 0.0074, the oxygen utilization rate, a', was 0.52, and the endogenous utilization rate, b', was 0.34. The total treatment system consisted of pH adjustment, API separator, equalization tank, dissolved air flotation (DAF), aerated lagoon, activated sludge, and a final clarifier. Results of full-scale operation indicated a BOD5 of 5000 mg/l in the raw wastewater was reduced to 12 mg/l in the final effluent. Oil and grease levels were reduced from a raw wastewater concentration of 2515 mg/l to 10 mg/l. (EPA-Corvallis)
W76-08293

COMBINED TREATMENT OF LEATHER TANNING AND MUNICIPAL WASTES AT GRAND HAVEN, MICHIGAN,
Prein and Newhof, Consulting Engineers, Grand Rapids, Mich.
C. V. Huber, and G. E. Jones.
Presented at 29th Annual Purdue Industrial Waste Conference, May 9, 1974. Purdue University, West Lafayette, Indiana. 20 p, 4 fig, 2 tab.

Descriptors: *Tannery wastes, *Waste water treatment, Waste treatment, *Activated sludge, Michigan, Municipal wastes, Industrial wastes, Pre-treatment(Water), *Aeration, Construction costs, Treatment facilities.
Identifiers: Pretreatment(Wastes), Combined treatment.

Design and construction are described of combined treatment for municipal and leather tanning wastes in which the tannery contributed 20 percent of the flow and 90-95 percent of the BOD and suspended solids. Major design considerations were: (1) Transportation of tannery waste, (2) Selection of method of treatment, (3) Protection of secondary treatment processes, (4) Solids dewatering and disposal, and (5) Odor control. Pretreatment facilities constructed at the tannery included screening for the hide and beamhouse wastewaters prior to combining with the rest of the tannery flow which enters an equalization tank. Processes chosen to the plant degign were : (1) Comminution and grit removal for the municipal wastewater, (2) aerated quick-mix tank for the blending and addition of chemicals to the combined municipal-tannery wastewater flow, (3) primary clarification of the combined wastewater flow, (4) activated sludge aeration system, (5) final clarification, and (6) chlorination. The total construction cost was $4.2 million with operation and maintenance cost estimated at $46 per million liters ($175 per million gallons) for domestic waste and $137 per million liters ($520 per million gallons) for the tannery waste. (EPA - Corvallis)
W76-08294

TRIVALENT CHROMIUM IN TANNERY EFFLUENTS,
Instituut TNO Leder en Schoenen, Waalwijk (Netherlands).
A. J. J. Van Meer.
September 1973. 8 p, 8 ref.

Descriptors: *Tannery wastes, *Toxicity, Chromium, Sludge, Disposal, Effluents, Industrial wastes, *Waste water treatment, Waste disposal.
Identifiers: *Chromium removal.

The pollution potential of chromium in tannery effluents is reviewed. Four areas covered are: (1) tanning with chromium salts, (2) amounts of trivalent chromium (Cr3+) discharged and general precautions which can reduce these amounts, (3) toxicity of tri-valent chromium in wastewaters, and (4) tri-valent chromium in the sludge of sewage works. Conclusions were: (1) Tannery effluents do not contain Cr6+, (2) A difference must be made between Cr6+ and Cr3+ and also between soluble and insoluble Cr3+ compounds when setting effluent limitations, (3) Method of sludge disposal must be considered when regulatory agencies establish a tolerance level for Cr3+, (4) Within certain limits the amounts of Cr3+ discharged per day may be more important than the concentration. (EPA-Corvallis)
W76-08295

CHANGING HOG HAIR FROM COSTLY NUISANCE TO ASSET.
Penn Packing Co., Philadelphia, Pa.
The National Provisioner, April 6, 1974, p. 10-14.

Descriptors: *Food processing industry, *By-products, Hogs, Industrial wastes, Protein, Hydrolysis, Chemical degradation, Costs, *Waste water treatment, Water pollution control, *Digestion.
Identifiers: *Hog processing wastes, *Hair hydrolyzer, Waste reduction.

A hog hair hydrolyzer was installed to eliminate the necessity of disposing the hair on landfill. A high quality digestible protein is produced. As a finished meal the product had average protein and pepsin digestibility percentage ratings of 90 and 77, respectively. On a wet basis protein percentage ratings averaged 55. Processing of toenails produced a finished meal with a 91 percent protein rating and a 81 percent digestibility rating. Crude fiber ranged from 0.67 to 0.3 percent. Actual cost figures have not been determined, but the hydrolyzing system gives a favorable payback period and the company no longer has to pay to have the hair hauled away. (EPA - Corvallis)
W76-08297

RECYCLING OF WATER IN POULTRY PROCESSING PLANTS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 3E.
W76-08298

USE, CONTINUED USE, AND REUSE OF BOTH PROCESS AND WASTE WATERS IN POULTRY PROCESSING OPERATIONS,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W76-08299

ECONOMICS OF IN-PLANT WASTE MANAGEMENT IN FOOD PROCESSING,
Economic Research Service, Washington, D. C. Natural Resource Economics Div.
For primary bibliographic entry see Field 3E.
W76-08300

FOOD HABIT OF VORTICELLIDAE ISOLATED FROM ACTIVATED SLUDGE,
Tokyo Univ. (Japan). Inst. of Applied Microbiology.
R. Sudo, and S. Aiba.
Jap J Ecol. 21(3/4), p 140-146, 1971.

Descriptors: Activated sludge, Sewage treatment, Biological treatment, Waste water treatment, *Bacteria, Isolation, Water purification.
Identifiers: Vorticella-Alba, Vorticella-Convallaria, Vorticella-Microstoma, *Vorticellidae.

To determine the food habits of 3 spp. of Vorticellidae (V. microstoma, V. convallaria, V. alba) which are significant in purifying waters polluted by activated sludge, pure cultures of several strains of bacteria which were expected to be in the sludge were prepared. Some of the bacteria could be metabolized by Vorticellidae. If a mixed diet of the bacteria favorable for protozoan growth was given, the specific growth rate of Vorticellidae approached that value which occurred when the heterogeneous bacteria isolated from the sludge were given in situ. V. microstoma did not proliferate in the sludge extract medium when the favorable bacteria as food were inactivated by antibiotics and no growth of the protozoa was noted when sterile rice-bran, boiled egg yolk or sterilized suspended solid from raw sewage was given as food. Vorticellidae were presumed to take only the bacteria and were stenophagic and holozoic. The relationship demonstrated between the microflora and microfauna in the sludge may lead to the biochemical and microbiological control of the biotic community in the activated sludge process.--Copyright 1976, Biological Abstracts, Inc.
W76-08309

INTRODUCTION TO HYDROBIOLOGY. HYDROBIOLOGY: A COMPENDIUM FOR ENGINEERS AND NATURAL SCIENTISTS, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-08315

DETERMINATION OF BIOLOGICAL DEGRADABILITY OF ORGANIC SUBSTANCES,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
For primary bibliographic entry see Field 5B.
W76-08351

EFFECTS OF GRAZING ON INFILTRATION RATES IN WASTE WATER SPRAY FIELDS,
West Virginia Univ., Morgantown. Div. of Plant Sciences.
For primary bibliographic entry see Field 5E.
W76-08352

WATER QUALITY CRITERIA FOR GREAT LAKES WATERS TO BE USED AS MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Canada Centre for Inland Waters, Burlington (Ontario).
D. H. Matheson.
Scientific Series No. 43, 1975. 50 p, 2 tab, 105 ref.

Descriptors: *Water quality standards, *Great Lakes, *Water purification, *Municipal water, *Potable water, Water quality, Public health, Aquatic life, Intakes, Wells, Aesthetics, Toxins, Water quality control, Bacteria, Viruses, Mineralogy, Water policy, Alaklinity, Dissolved oxygen, Chlorides, Sulfates, Fluorides, Bromine, Iodine, Dissolved solids, Ammonia, Arsenic compounds, Cadmium, Chromium, Cobalt, Copper, Iron, Manganese, Lead, Mercury, Nitrates, Nickel, Zinc, Asbestos, Organic matter, Odor, Activated carbon, Water supply.
Identifiers: Cyanide, Raw water criteria.

A frame of reference is based on practical problems and research needs of industry concerned with treatment and disposal of waste water and provision of adequately treated water for municipal use as related to the physical situation of the Great Lakes and interconnecting waterways. The history of the development of water quality standards is reviewed. Factors affecting the quality of raw waters (sewage treatment effluents, industrial wastes, urban street runoff, land drainage, dredging and spoil disposal, and movement of pol-

luted water) are discussed. Criteria for specific water quality parameters are discussed in connection with microbiology, viruses, mineral consitutents (total dissolved solids, pH, alkalinity, hardness, chlorides, sulfates), fluoride, bromine, iodine, dissolved oxygen, ammonia, arsenic, cadmium, chromium, cobalt, copper, cyanide, iron, manganese, lead, mercury, nitrates, nickel, zinc, asbestos, organic matter, and odor. Special attention is given to the question of organic matter in water--natural sources, treated sewage, and organics released by the chemical industry. Research is needed on every aspect of the supply-and-use cycle: effectiveness of waste treatment processes; effects of substances in treated wastes on the environment, especially intake water quality; and the effectiveness and efficiency of standard and advanced purification processes. (Buchanan-Davidson--Wisconsin)
W76-08363

THE KINETICS OF MICROBIAL NITRIFICATION,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
G. M. Wong-Chong, and R. C. Loehr.
Water Research, Vol. 9, No. 12, p. 1099-1106, 1975. 16 fig., 16 ref.

Descriptors: *Kinetics, *Microorganisms, *Nitrification, *Sewage treatment, Nitrogen, Nitrites, Hydrogen ion concentration, Temperature, Chemical reactions, Equations, Ammonification, Oxidation, Aerobic conditions, Ammonia, Waste water treatment.

The kinetics of the microbial reactions involved in the conversion of organic nitrogen to nitrate was examined. The type of reaction of each stage and the effects of the operating variables (microbial concentration, pH, and temperature) on these reaction rates were determined. The results were correlated into equations which defined the reaction sequence mathematically. The reaction sequence for aerobic conversion of organic nitrogen to nitrate consists of a first-order reaction for ammonification and zero order reactions for both nitrification processes. Nitrification rates were correlated as a function of a maximum oxidation rate, a reaction rate constant, and the responsible microbial mass, using acorrelation form similar to the Michaelis-Menten equation. Temperature and pH effects on oxidation rates were established with the maximum rates unaffected by temperature, and the reaction rate constants obeying Arrhenius' law. The pH for optimum oxidation is about 7.0-7.5. The information could be used to indirectly measure the nitrification population in treatment systems. When no inhibitors are present, the rate limiting step of the reaction sequence is the oxidation of ammonia. The applicability of the data to nitrogen removal systems containing highly nitrogenous wastes is discussed. (Buchanan-Davidson--Wisconsin)
W76-08369

COMMERCIAL MEMBRANE DESALTING PLANTS: DATA AND ANALYSIS,
DSS Engineers, Inc., Ft. Lauderdale, Florida.
For primary bibliographic entry see Field 3A.
W76-08370

FIELD EVALUATION TESTING OF REVERSE OSMOSIS HIGH PRESSURE PUMPS AND ENERGY RECOVERY TURBINES.
Catalytic, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 3A.
W76-08372

DEVELOPMENT OF REVERSE OSMOSIS MEMBRANES AND SPIRAL DESIGN MODULES FOR DEMINERALIZATION OF BRACKISH WATERS AT LOW PRESSURES,
Gulf Environmental Systems Co., San Diego, Calif.
For primary bibliographic entry see Field 3A.
W76-08373

DEMAND BACTERICIDE FOR DISINFECTING WATER AND PROCESS OF PREPARATION,
Kansas State Univ. Research Foundation, Manhattan. (Assignee).
J. L. Lambert, and L. R. Fina.
U. S. Patent No. 3,923,665, 8 p, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 319, December 2, 1975.

Descriptors: *Waste water treatment, *Patents, *Water treatment, Water quality control, Water pollution treatment, *Disinfection, *Water purification, *Bactericides, Anion exchange, Chemical reactions, Resins, Iodides, Ion exchange.

Complete bacterial sterilization of highly contaminated water can be achieved without introducing objectionable amounts of iodine into the water. A strong base anion exchange resin is reacted with triiodide ions to form a stable compound of extremely low dissociation in water. The association of the triiodide ions with the basic exchange sites (cationic groups) of the resin is such as to block the sites from normal ion exchange with ions in the solution. The process of preparing the demand bactericide is described wherein the resin-triiodide complex is washed with water until the wash water gives a negative test for oxidizing iodine. The resin preferably is a quaternary ammonium resin which is first reacted with an alkylating agent to eliminate residual amine groups. (Sinha-OEIS)
W76-08391

WATER FILTER ASSEMBLY,
For primary bibliographic entry see Field 8C.
W76-08392

METHOD FOR TREATING SEWAGE WATER,
Diamond Shamrock Corp., Cleveland, Ohio (Assignee).
R. W. Fenn III, and K. J. O'Leary.
U. S. Patent No. 3,943,044, 8 p, 3 fig, 1 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 944, No 2, p 828, March 9, 1976.

Descriptors: *Patents, Waste water treatment, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, *Electrolysis, Chemical reactions, Anodes, Bubbles.

An electrolytic apparatus and method for rapidly and efficiently removing the suspended solids from and disinfecting the sewage water effluent from both large scale and portable applications is described. The apparatus has a combination stirrer-disintegrator for converting the suspended solids to small particle size materials, disinfecting and solids conveying means comprising at least one pair of diaphragm-free electrodes including a closely-spaced cathode and a dimensionally stable anode and a source of aqueous alkali metalhalide solution, and effluent means for removing the sterilized, substantially solids-free water from the chamber. The in-situ electrolytic treatment provides sterilization and solids removal in one chamber or vessel. Bubble formation is developed by the dimensionally stable anodes causing rapid flotation of suspended solids to the surface and thus enables rapid removal of solids. (Sinha-OEIS)
W76-08394

PROCESS FOR PURIFICATION OF INDUSTRIAL WASTE WATERS FROM PERCHLORATES AND CHLORATES,
V. N. Korenkov, V. I. Romanenko, S. I. Kuznetsov, and J. V. Voronov.
U. S. Patent No. 3,943,055, 3 p, 3 ref; Offical Gazette of the United States Patent Office, Vol 944, No 2, p 831, March 9, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Domestic wastes, Water pollution treatment, Water quality control, Water pollution control, Water purification, Biochemistry, Biodegration, Anaerobic digestion, Microorganisms.
Identifiers: *Perchlorates, *Chlorates.

The process of this invention involves intermixing of industrial waste waters with household-communal waste waters with the subsequent biochemical reduction of perchlorates and chlorates contained in the waters under anaerobic conditions by means of a strain of the microorganism Vibrio dechloraticans Cuznesove B-1168 grown by way of successive inoculations on a liquid nutrient medium containing sources of carbon, nitrogen, and phosphorus under anaerobic conditions in the presence of a perchlorate as a donor of oxygen. The purified water is then separated. (Sinha - OEIS)
W76-08395

CATALYTIC FILTERING-INCINERATING PROCESS AND DEVICE FOR WASTE WATER,
Thiokol Corp., Newtown, Pa. (Assignee).
D. B. Davis, and W. N. Christensen.
U. S. Patent No. 3,944,487, 3 p, 4 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1362, March 16, 1976.

Descriptors: *Patents, *Waste water treatment, Water quality control, Water pollution control, *Water pollution treatment, *Oxidation, *Filtration, Catalysts, *Incineration.
Identifiers: Hypochlorite ions.

The process for removing pollutants from waste water uses a granular, porous, regenerative, catalytic material of oxides of at least one metal selected from nickel, cobalt, iron, iridium, and mixtures thereof formed by oxidizing these metals when placed within the pores of aluminas having openings from 80 to 1000 angstroms, or molecular sieves with channels having openings from 8 to 40 angstroms. The waste water which is prescreened to remove foreign objects such as razor blades, toothpaste tubes, wood, etc., and to which hypochlorite ions are added is flowed through at least one bed of this catalytic material. The catalytic materials filters out and entraps pollutants, while simultaneously catalyzing the decomposition of hypochlorite ions into oxygen atoms which oxidize the pollutants as the water flows through the bed. After a pre-determined time, oxidizing gas containing oxygen is flowed through the bed and incinerates the entrapped pollutants. The catalytic material catalyzes the incineration of these entrapped pollutants and regenerates itself by means of the oxidizing gas. This results in a more rapid removal of the pollutants and a greatly extended bed life. (Sinha-OEIS)
W76-08400

REMOVING HEAVY METAL IONS FROM WATER,
Department of Agriculture, Washington, D. C. Office of the Secretary. (Assignee).
J. M. Randall, E. Hautala, A. C. Waiss, Jr., and J. A. Kuhnle.
U.S. Patent No. 3,944,415, 4 p, 3 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1342, March 16, 1976.

Descriptors: *Waste water treatment, *Patents, Water quality control, *Water purification, *Chemical wastes, Water pollution control, *Water pollution treatment, Mercury, *Heavy metals, Bark, Wood wastes, Peanuts, Filtration, Ions.
Identifiers: Nut waste, Formaldehyde, *Peanut skins.

Peanut skins or other nut waste or tree bark is modified by reaction with formaldehyde. The reaction is conducted in an aqueous system under

acidic conditions. Peanut skins are mixed with about 10 parts of water containing about 0.5 to 1 percent of an acid such as sulphuric, hydrochloric or phosphoric. After the peanut skins have been mixed with the dilute acid, 15-20 percent (based on the weight of peanut skins) of formaldehyde is added. The mixture is stirred and then allowed to stand for 2-3 hours at 50-70 deg C. Following this standing period the liquid is separated from the modified skins, which are washed and dried. The formaldehyde-modified peanut skins are then formed into a bed and the water containing heavy metal ions are allowed to percolate through them. Or the modified skins may be placed in a column and contaminated water pumped through. Contact is effected and maintained for a period long enough for the heavy metal impurities to be absorbed by the modified peanut skins. (See also W76-08402) (Sinha - OEIS)
W76-08401

REMOVAL OF HEAVY METAL IONS FROM WASTEWATER,
Department of Agriculture, Washington, D. C. Office of the Secretary. (Assignee).
C. L. Swanson, R. E. Wing, and W. M. Doane.
U.S. Patent No. 3,947,354, 7 p, 8 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2452, March 30, 1976.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Water pollution treatment, Water quality control, Water pollution control, *Heavy metals, Separation techniques, Chemical reactions, Polymers, Polyelectrolytes.
Identifiers: Starch xanthate.

The method of removing heavy metal ions from aqueous solutions to levels which are below or very close to the most stringent limits comprises determining the amount of heavy metals ions in an aqueous solution, adding to the aqueous solutions a water-soluble cationic polymer and a water-soluble anionic polymer such as starch xanthate in amounts sufficient to form a cationic polymer-heavy metal ion-anionic polymer complex precipitate, and separating the precipitate from the supernatant. The water-soluble cationic polymer is present in the aqueous solution in amounts of from 1 to 2,000 times the weight of heavy metal ions. (See also W76-08401) (Sinha - OEIS)
W76-08402

METHOD AND APPARATUS FOR DRYING MOISTURE-CONTAINING SOLIDS, PARTICULARLY DOMESTIC REFUSE AND SLUDGE CAKES,
A. Osdor.
U.S. Patent No. 3,946,495, 12 p, 8 fig, 5 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2171, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, *Sludge treatment, *Sewage treatment, Water pollution treatment, Sludge disposal, Incineration, Separation techniques, Water purification, Vapor compression distillation, Steam, Steam turbines, Condensation, Potable water, Distillation, Water reuse.

A method and apparatus are described for the production of solid fuel and steam by drying moisture-containing solids, such as refuse and sludge cakes, in a multistage heating zone by using the moisture-containing solids as the feed-water in a direct contact countercurrent flow pressurized boiler. After vaporizing the bulk of the moisture in the heating zone of the boiler, the solid residue is further dried in a multi-stage flashing zone. From the upper end of the heating zone is removed a nearly saturated steam including the water vapor evaporated from the moisture-contained solids by the heat of cooling of the introduced superheated steam. A portion of the removed steam equal to the vaporized moisture is heated and then directed to a turbine, generating all the power required to operate the system. The bulk of the removed steam equal to the introduced superheated steam is compressed, reheated and recycled through the heating zone. The dried solid is removed at the lower end of the flashing zone and is incinerated, and the recovered heat is utilized to supply the heat required for the drying, and to produce saturated steam for heating purposes, or superheated steam for power generation. In the latter case the heat of condensation of the turbine exhaust steam is utilized advantageously as a heat source in a distillation plant for fresh water production. (Sinha - OEIS)
W76-08404

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER FROM AQUEOUS WASTES,
Hanover Research Corp., East Hanover, N. J. (Assignee).
C. Greenfield, R. E. Casparian, and A. J. Bonanno.
U. S. Patent No. 3,947,327, 9 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2445, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution control, Water pollution treatment, Water quality control, Industrial wastes, Scaling, Corrosion, Evaporation, Condensation, Evaporators, Desalination, Oil.

The apparatus and process described comprise a systematic arrangement of equipment and a series of steps for recovering clean water from aqueous wastes by evaporation while avoiding fouling and scaling as well as corrosion of evaporator tubes. Addition of an oil, preferably a volatile oil, to the aqueous waste feed results in the formation of a coating of the oil on the surfaces of the tubes, thereby preventing corrosion and fouling and build-up of scale deposits. Volatile oil that distills over is separated from the aqueous distillate by conventional means and may be recirculated. (Sinha - OEIS)
W76-08408

PROCESS OF PREPARING SEWAGE SLUDGE FOR DEWATERING,
Envirotech Corporation, Menlo Park, CA (Assignee).
P. J. Cardinal, Jr.
U. S. Patent No. 3,947,350, 5 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2451, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water pollution control, Water quality control, *Tertiary treatment, *Sludge treatment, Dewatering, Carbon dioxide, Incineration, Chemical reactions.

The invention relates to the field of effective dewatering of sewage sludge by altering its chemical make up following phosphorous removal by lime precipitation in a tertiary sewage treating process. Sewage and lime sludge are prepared for dewatering by introducing a source of carbon dioxide into a raw sewage treating system subsequent to lime dosing to effect transformation of the hydroxide salts in the sludge to a carbonate form in which form subsequent dewatering and ultimate disposal of the sludge is greatly facilited. If gaseous carbon dioxide is introduced into the system, one suitable source is the gaseous products of combustion obtained when dewatered sludge is burned in a suitable furnace, such as an incinerator or a lime recalcining kiln. Alternatively, sulfuric acid or hydrochloric acid or other pH of the sludge. Conversion of the sludge to the carbonate form is effected in conjunction with the production of carbon dioxide during the neutralization reaction effected by the chemical reactants introduced into the system. Desirably, the carbon dioxide is utilized in the system in a molar ratio of approximately 1 to 1 with the calcium hydroxide dosed into the system. (Sinha - OEIS)
W76-08409

WATER AND WASTE MANAGEMENT IN POULTRY PROCESSING,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W76-08428

THE CONTROL OF CHLORIDE IONS IN THE MGO RECOVERY SYSTEM,
Babcock and Wilcox Co., Alliance, Ohio. Research and Development Center.
R. A. McIlroy.
Tappi, Vol. 56, No. 9, p 79-82, September, 1973. 1 fig, 4 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Corrosion, *Chlorides, Ions, Sulfite liquors, *Pulp wastes, *Corrosion control.
Identifiers: Magnesium oxide recovery.

A control system has been designed for the MgO recovery process which can greatly reduce corrosion by maintaining a low chloride ion level. The basis of the system is that chlorides leave the recovery boiler as HCl and can be readily removed from the flue gas by a venturi absorber. Process and economic studies have demonstrated that it is better to treat the absorber effluent to recover the MgO and SO2 which also are removed from the flue gas by the HCl absorber than to attempt prior treatment to prevent their removal. More than 95% of the chloride will be removed while the MgO loss can be held to an acceptable level. A conceptual design has been developed to combine the chloride ion control system with the MgO recovery system. (Sandoski-FIRL)
W76-08457

TOXIC CONSTITUENTS IN PULP MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5A.
W76-08458

METHOD AND APPARATUS FOR THE DESTRUCTIVE DECOMPOSITION OF ORGANIC WASTES WITHOUT AIR POLLUTION AND WITH RECOVERY OF CHEMICAL BYPRODUCTS,
California Univ., Berkeley. (Assignee).
D. L. Brink, and J. F. Thomas.
United States Patent 3,761,568. Issued September 25, 1973. Official Gazette of the United States Patent Office, Vol. 914, No. 4, p 1431, September 25, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Organic wastes, *Patents, Water vapor, Oxygen, Air pollution, *Pulp wastes.
Identifiers: *Pyrolysis, Kraft black liquor, Secondary pollution prevention.

A method for the destructive distillation and pyrolysis of organic material such as kraft black liquor has been patented. The material is held at elevated temperatures for a time sufficient to break down the material to non-combustible solids and a stable, clear-burning gaseous fuel. The temperature during pyrolysis is maintained at a level and for a time sufficient to prevent the recombination of intermediate products to compounds which would cause air pollution. A controlled amount of oxygen, which can take the form of malodorous emission gases such as those formed in the operation of a kraft mill or other industrial plant, is continuously introduced during pyrolysis to provide energy by exothermic oxidative reactions. The amount of oxygen introduced is insufficient to ef-

fect complete combustion of the reaction mixture. The water vapor content in the pyrolysis zone where cracking occurs is maintained at a level high enough to insure that carbon particles in the zone will react with water to form hydrogen and carbon monoxide. (Sandoski-FIRL)
W76-08459

FOAM DETOXIFICATION OF BLEACHED KRAFT EFFLUENT,
B. C. Research Ltd., Vancouver.
K. S. Ng, J. C. Mueller, and C. C. Walden.
Paper Trade Journal, Vol. 157, No. 41, p 45, October 8, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Foam separation, *Pulp wastes, Toxicity, Suspended solids, Fish.
Identifiers: Detoxification, Bleached kraft mill wastes.

Batch and continuous systems have been used to study the technical feasibility of detoxifying bleached kraft whole mill effluent by foam separation. Process variables such as gas/liquid ratio, pH, temperature, column height, and mode of operation were investigated. Bleached kraft whole mill effluents with initial Median Survival Time (MST) values for fish of 6 to 12 hours can be detoxified at pH greater than 7, temperature above 20 C, gas/liquid ratios of less than two, and retention times of about 15 minutes. Effluents with MST values ranging from 3 to 6 hrs require 30 minutes for detoxification under similar conditions. Bubble size, pH, and gas/liquid ratio determine the process efficiency; temperature and column height have little effect. Foam separation also reduces foaming tendency and removes fibrous suspended solids. (Sandoski-FIRL)
W76-08460

DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
J. C. Mueller, and C. C. Walden.
Paper Trade Journal, Vol. 157, No. 41, p 46, October 8, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Biochemical oxygen demand, Toxicity, Pilot plants, Aerated lagoons, Activated sludge, *Pulp wastes.
Identifiers: *Detoxification, Bleached kraft mill wastes.

Four BOD reduction systems, 5-day and 3-day retention aerated lagoons and 8-hr and 24-hr retention activated sludge units, were compared for BOD5 and toxicity removal efficiency on bleached kraft whole mill effluent. The systems were operated with and without surge equalization at various temperatures. During operation with surge equalization, the five-day lagoon achieved the highest BOD5 removal and the most consistent detoxification. The 3-day lagoon and the 24-hr and 8-hr activated sludge systems were slightly less effective. During operation without surge equalization, BOD5 removal by the four systems remained essentially the same, but detoxification efficiency was reduced by 15-30%. Temperature variations between 60 and 90 F had no significant effect on the performance of the systems. Operation of the activated sludge systems at sludge loadings of less than 0.3 mg BOD5/day/mg MLVSS produced detoxified effluent with a 96% sucess rate; operation at higher sludge loadings reduced the detoxification success rate to about 70%. (Sandoski-FIRL)
W76-08461

PAPER PULP EFFLUENT PURIFICATION.
French Patent FR 2159560. Issued June 22, 1973.
Derwent French Patents Report, Vol. U, No. 35, p D4-D5, June, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Patents, Chemical precipitation, Flocculation, Lignins, *Pulp wastes.
Identifiers: Chemical pulp, Semi-chemical pulp, Aluminum sulfate.

A method for treating pulp wastes has been patented. Effluent from the manufacture of chemical and semi-chemical paper pulp is purified by precipitating nonbiodegradable materials in Stage One by the addition of excess aluminum sulfate to a pH 3.8. The clarification solution is then fed to Stage Two for flocculation with the excess dissolved aluminum sulfate at pH 5.4. The precipitate from Stage One and floc from Stage Two are treated to recover aluminum sulfate. The process effectively removes nonbiodegradable salts. (Sandoski-FIRL)
W76-08462

KRAFT EFFLUENT TREATMENT BY FLOTATION,
Saint Mary's Univ., Halifax (Nova Scotia).
E. R. Hayes, and V. G. Munroe.
Paper Trade Journal, Vol. 157, No. 41, p 42, October 8, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Waste water disposal, *Froth flotation, Coagulation, Flocculation, Color, Biochemical oxygen demand, Chemical oxygen demand, Odor, Polyelectrolytes, Flotation.
Identifiers: Kraft mill wastes, Dispersed air flotation, Alum.

Recent efforts had been expended on the development of efficient processes for the treatment or disposal of kraft mill effluents. The system selected for study was that of froth flotation with dispersed air as the transport medium. The relationship between dosage of coagulant and flocculant aid, pH, agitation with respect to float formation, color removal, decrease in biological oxygen demand and chemical oxygen demand, and odor removal were investigated. Several inorganic coagulants and synthetic organic flocculant aids alone and in combination were tested. Alum and selected cationic, synthetic, high molecular weight polyelectrolytes were most effective. Dispersed air flotation of total effluent with alum-cationic polyelectrolyte removed 90% of the color. The BOD and COD were reduced by 50 and 66%, respectively. (Sandoski-FIRL)
W76-08463

THE EFFECTS OF HIGH SODIUM CHLORIDE CONCENTRATIONS AND HIGH POLLUTANT LOADS ON THE COMPOSITION OF THE ACTIVATED SLUDGE MICROFLORA IN THE TREATMENT OF PETROLEUM REFINERY-GENERATED EFFLUENTS (WPLYW WYSOKIEGO STEZENIA CHLORKU SODOWEGO I DUZEGO LADUNKU ZANIECZYSZCZEN NA SKLAD MILROFLORY OSADU CZYNNEGO PRZY OCZYSZCZANIU SCIEKOW RAFINERYJNO-PETROCHEMICZNYCH).
H. Boszczyk, and E. Cebula.
Gaz, Woda i Technika Sanitarna, Vol. 47, No. 6, p 192-194, 1973. 3 fig, 2 tab, 9 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, Activated sludge, Microorganisms, Sodium chloride, Oil wastes, Organic compounds.
Identifiers: Refinery wastes.

Studies were performed to determine the effects of high sodium chloride and pollutant loads on the species composition of activated sludge in the treatment of petroleum-refinery generated effluents. The equipment used for sludge purification on a bench scale included a container of raw sewage, a column for cultivating activated sludge, and a container for purified sludge. Analyses of BTU, oxygenation, phenol concentration, by-volume coefficient of active sludge, and macro- and microscopic observation of the activated sludge indicated that the number of microflora decreased significantly during testing days 2 to 16 and increased during the third stage (days 17 to 22). High sodium chloride concentrations lead to changes in flake structure, decrease in flake size, flake performance, liberation of bacteria from flakes, absence of protozoa, decrease of purification process productivity, and a decrease of sludge volume coefficient. (Urbanski-FIRL)
W76-08464

EFFLUENT TREATMENT IN SELECTED ORGANIC CHEMICAL FACTORIES,
Central Public Health Engineering Research Inst., Nagpur (India).
G. J. Mohanrao, P. V. R. Subrahmanyam, S. S. Mudri, and S. B. Deshmukh.
Indian Chemical Journal, Annual Tissue, p 198-206, 1972. 4 fig, 8 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Organic wastes, Chemical industry, Dyes, Neutralization, Biological treatment, Aerated lagoons, Chemical precipitation, Chlorination, Toxicity, Color.
Identifiers: Synthetic drugs, Petrochemical wastes.

Work performed at the Central Public Health Engineering Research Institute in Nagpur, India, on the treatment of three plants producing organic chemicals, petrochemicals (DMT and xylenes), synthetic drugs, and textile dyes was the basis for the development of flow sheets for waste treatment. Treatment of the wastes from the DMT and xylene plants consisted of lime neutralization followed by biological treatment using a combination of aerated lagoon and oxidation ditch extended aeration plant. Effluent from the plants meets standards for industrial effluents discharged to inland surface waters. The synthetic drugs effluent treatment consisted of neutralization of the acidic waste with lime and sludge separation and drying on sand beds, and dilution of the alkaline wastes with sewage and floor washes followed by biological treatment. Combined effluent discharge to sewers conformed to standards. Treatment of the wastes from the manufacture of textile dyes comprised precipitation of zinc at a pH of 9.2 with lime, sedimentation, biological treatment, and chlorination of the supernatant. The treated waste was non-toxic to aquatic life and essentially colorless. (Sandoski-FIRL)
W76-08465

STAFFLINERS PREVENT CONTAMINANTS FROM POLLUTING GROUND WATER AT INDUSTRIAL WASTE TREATMENT CENTER.
Pollution Engineering, Vol. 5, No. 9, p 8, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Groundwater, Water pollution control, Storage, Capital costs, *Linings.
Identifiers: Hypalon linings, Groundwater pollution prevention.

Ultra-wide, impermeable linings have been installed to prevent groundwater contamination by waste chemicals stored in a series of open basins at regional treatment and disposal facilities. Rollins Environmental Services (RES) which operates a network of treatment centers for industrial wastes and chemicals, stores the environmentally hazardous wastes in concrete basins protected with Hypalon linings. Open storage basins entail the least capital cost on a per gallon basis. The protection provided by liners makes this type of storage environmentally acceptable. (Sandoski-FIRL)
W76-08466

RECOVERY AND SEPARATION OF CHEMICALS PRODUCED DURING KRAFT PULPING OPERATIONS,
Scott Paper Co., Philadelphia, Pa. (Assignee).
K. W. Baierl.
United States Patent 3,764,461. Issued October 9, 1973. Official Gazette of the United States Patent Office, Vol. 915, No. 2, p 624, October, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Chemical wastes, *Separation techniques, Distillation, *Patents, *Pulp wastes.
Identifiers: Steam fractionation.

Chemicals produced during kraft pulping operations can be recovered by steam fractionation. The chemicals are further separated by refluxing the more volatile chemicals in the fractionating column to isolate a volatile chemical fraction and a crude turpentine fraction comprising primarily alpha-terpineol. The chemicals present in the volatile fraction can then be separated by four-step process. The volatile chemical fraction is treated with a hot caustic solution to remove a sulfur-containing-chemicals fraction from the volatile chemical fraction. The volatile chemical fraction is treated with steam in a second fractionating column to produce a mixture of chemicals. The more volatile chemicals present in the mixture are refluxed to separate a second volatile chemical fraction and a second crude turpentine fraction comprising primarily alphapinene. The chemicals in the second volatile chemical fraction are finally separated by distillation. (Sandoski-FIRL)
W76-08467

LAND TREATMENT OF FOOD PROCESSING WASTEWATERS,
Campbell Soup Co., Camden, N. J. Environmental Engineering Dept.
For primary bibliographic entry see Field 5E.
W76-08468

RUM DISTILLERY WASTES: LABORATORY STUDIES ON AEROBIC TREATMENT,
Virgin Islands Dept. of Public Works.
W. E. Burnett.
Water and Sewage Works. Vol. 120, No. 9, p 107-111, September, 1973. 1 fig, 3 tab, 13 ref.

Descriptors: *Aerobic treatment, *Waste water treatment, *Industrial wastes, *Food processing industry, Activated sludge, Trickling filters, Laboratory tests, Neutralization, Biochemical oxygen demand, Aerobic conditions.
Identifiers: *Rum distillery wastes.

A laboratory scale study of the treatment of rum distillery wastes by the activated sludge and trickling filter processes is discussed. Benchscale treatment plants were used to determine trends, problems, and possible solutions likely to be important in the operation of full scale waste treatment plants. Both activated sludge and trickling filter could be effective if the waste was neutralized prior to treatment and nutrients were added when needed. Either process or combination of both processes might be used as a roughing process to reduce the BOD5 loading on a municipal treatment plant receiving rum wastes. (Sandoski-FIRL)
W76-08469

A PEROXYGEN SYSTEM FOR DESTROYING CYANIDE IN ZINC AND CADMIUM ELECTROPLATING RINSE WATERS,
E. I. DuPont de Nemours and Co., Wilmington, Del. Industrial Chemicals Dept.
B. C. Lawes, L. B. Fournier, and O. B. Mathre.
Plating, Vol. 60, No. 9, p 902-909, September, 1973. 11 fig, 3 tab, 13 ref, 1 append.

Descriptors: *Waste water treatment, *Industrial wastes, Chemical precipitation, Heavy metals, *Zinc, *Cadmium, Filtration.
Identifiers: *Electroplating wastes, *Cyanide, *Peroxygen.

A one-stage patented process which uses a peroxygen compound system to destroy free cyanide and precipitate zinc and cadmium metals in electroplating rinse waters is described. A proprietary peroxygen compound and formalin are added in controlled amounts to rinse water in a holding tank. The reaction is fast and control is simple. In one hour or less, the treated rinse can be discharged directly to the sewer through a filter which collects the zinc and cadmium precipitates. The process can also be used to treat other cyanide-containing waste waters. (Sandoski-FIRL)
W76-08470

PROCESS FOR THE ELECTROLYTIC RECLAMATION OF SPENT ETCHING FLUIDS,
Electrodics, Inc., Philadelphia, Pa. (Assignee).
C. E. Tirrell.
United States Patent 3,761,369. Issued September 25, 1973. Official Gazette of the United States Patent Office, Vol. 94, No. 4, p 1394, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Electrolysis, Industrial wastes, Metals, Cathodes, Anodes, Ion exchange, Copper, Oxidation, *Patents.
Identifiers: *Copper etching wastes, *Electrolytic reclamation.

A patent has been issued for a method and apparatus for the electrolytic reclamation of spent copper etching fluids. The problem of waste discharge stream pollution by aqueous solutions of iron and chromium metal is corrected by passing the spent etchant, as the catholyte, into the cathode chamber of a two chamber elecrrolytic cell having an anion permselective ion exchange membrane separating the cathode chamber from the anode chamber. The anolyte is the chemically reduced spent etchant of a previous batch. When a direct current is passed through the cell, copper is reduced and deposited on the cathode, and the chemically reduced spent etching fluid is oxidized in the anode chamber. The oxidized etching fluid is thereby reclaimed for further use. (Sandoski-FIRL)
W76-08471

TREATMENT OF PHOTOGRAPHIC FERROCYANIDE-TYPE BLEACH SOLUTIONS FOR REUSE AND DISPOSAL,
Computerized Pollution Abatement Corp., Leicester, N. Y.
T. N. Hendrickson, and L. G. Daignault.
Journal of the Society of Motion Picture Television Engineers, Vol. 82, No. 9, p 727-732, September, 1973. 15 fig, 7 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Electrolysis, Ozone, Chlorination, Heavy metals, Chemical precipitation, Recycling, *Water reuse, Waste water disposal.
Identifiers: *Photographic processing wastes, Ferricyanide, Ferrocyanide.

Methods to recover or destroy complex cyanides (ferrocyanide and ferricyanide) have been evaluated in laboratory studies. The processes examined included electrolysis, ozonation, chlorination, and heavy metal ion precipitation. The goal of the investigation was to determine the feasibility of using one or more of these methods to reduce the concentration of ferricyanide in both concentrated (10,000 to 100,000 mg/liter) and dilute (10 to 100 mg/liter) waste effluents. Ferrocyanide can be oxidized to ferricyanide in overflow photographic color process bleaches by electrolysis or ozone. The regenerated waste bleach can be recirculated for reuse in the process. Dilute concentrations of ferricyanide can be destroyed using ozone or chlorine under the proper conditions of temperature, pH, and catalayst addition. (Sandoski-FIRL)
W76-08472

INDUSTRIAL EFFLUENT TREATMENT,
Belgian Patent BE 794932. Issued May 29, 1973. Derwent Belgian Patents Report, Vol. U, No. 33, p D5, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Heavy metals, Oxidation, Flocculation, Coagulation, Sedimentation, Treatment facilities, *Patents.

A treatment method for industrial effluents from metallurgical furnaces has been patented. These wastes are treated in a compound vessel which simultaneously effects the previously isolated stages of oxidation to decompose the cyanides, and which effects mechanical flocculation to coagulate the pollution residues, ready for sedimentation. The vessel reduces the size, weight, and cost of this effluent treatment plant. (Sandoski-FIRL)
W76-08473

CRUDE SOAP RECOVERS MERCURY FROM WATER,
Agricultural Research, Vol. 22, No. 3, p 11, September, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Mercury, Potable water, *Soaps, Emulsions, Florida.
Identifiers: Crude black liquor soap.

The ARS Naval Stores Laboratory in Olustee, Florida has found products effective in reducing the mercury content of water to well below the 5 ppb now permitted in drinking water. The most effective product is crude black liquor soap, a 3-cent-per-pound byproduct of the kraft pulp process. The soap is derived from the kraft process where wood chips are cooked to release the cellulose fibers for use in paper making. In treating mercury-laden water, very small amounts of the black liquor soap are added to the water and mixed well. An emulsion forms and water insoluble mercury salts of the soap result. The emulsion is then broken by acidifying the solution and the solids containing the mercury are filtered. The recovered sludge can be buried, or the mercury recovered by treatment with acid, or the mercury containing products can be added to copper tallates or resinates. (Sandoski-FIRL)
W76-08474

TREATMENT METHOD FOR OIL-CONTAINING LIQUID WASTE (GANYU HAISUI SHORIHO),
R. Fukumori.
(Asada Chemical Industries), Japanese Patent 48-18069. Issued June 2, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil wastes, Oily water, Absorption, Polymers, Flocculation, Suspended solids, *Patents, Separation techniques.
Identifiers: Absorbent polymer foam powder.

Waste liquids from industrial sources can be treated effectively with most suspended solids being eliminated. However, oil diffused on the surface of such wastes is extremely difficult to arrest and the water after treatment will contain some residue oil. A method has been patented which eliminates oil residue by adding absorbent polymer foam powder prior to stirring the waste liquid with the chemical treating agent. Foam powder from an olefin group polymer or styrene group polymer absorbs oil while the suspension is coalesced by the chemical agent; the liquid is then filtered. The presence of foam powder enhances flocculation. The raw waste liquid with a turbidity of 420, pH of 5.99, 216.9 ppm n-hexane oil and 178 ppm COD, was heated from 80 to 100 C; 600 ppm polychloride aluminum was added followed by the addition of 0.5 grams of foam polyethylene micropowder. The mixture was rotated and mixed at 120 rpm's for five minutes. Caustic soda (10 ppm) was added,

pH was adjusted to 7, and the liquid was filtered. The treated liquid had a turbidity of 15, pH of 6.20 and contained 2.7 ppm n-hexane oil, and 38 ppm COD. (Seigle-FIRL)
W76-08475

ELIMINATION METHOD FOR MERCURY RESIDUE IN WATER (SUICHU YOZON SUIGIN NO JOKYOHO),
R. Kubo, M. Mizufune, and T. Ito.
(Takeda Pharmaceutical Company), Japanese Patent 48-13676. Issued April 28, 1973. 3 p, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Adsorption, *Mercury, *Activated carbon, *Patents.

A high performance adsorbent for high or low concentrations of mercury residues in waste liquid has been invented. The method of preparation of the adsorbent is simple; it is desirable for the mercury content in waste liquid to be low, but the method is applicable provided the concentration is below 30 ppm. The amount of adsorbent should be approximately 0.5 to 20 weight percent of activated carbon. This metallic salt can be a mixture of more than two kinds of elements, or a small amount of sodium carbonate or potassium carbonate can be added to the metal as a supplement. (Seigle-FIRL)
W76-08476

UPDATING AN EXISTING POLLUTION CONTROL FACILITY AT WESTERN ELECTRIC,
Western Electric Co., Inc., Allentown, Pa. Plant Engineering Dept.
W. B. Yorgey.
Industrial Wastes, Vol. 19, No. 4, p 16-18, 30-31, July/August, 1973. 9 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Treatment facilities, Neutralization, Suspended solids, Costs, Chromium.
Identifiers: *Cyanide wastes.

Western Electric's Allentown Works (Allentown, Pennsylvania) treats acid-alkaline, chrome, cyanide, and suspended solids wastes. Neutralization facilities were added to the existing acid-alkali treatment facilities, and tanks were added which convert cyanide wastes to carbon dioxide and water. New facilities for reducing chrome wastes and removing suspended solids were installed as well as an integrated system of monitoring and control instrumentation. Increases in production and more stringent effluent requirements have resulted in a present discharge of about 800,000 gpd of treated waste water. About one million dollars worth of treatment facilities have been added to the original waste water plant. (Sandoski-FIRL)
W76-08477

PLATING WASTE RECOVERY UNIT,
A. Yagishita.
United States Patent 3,761,381. Issued September 25, 1973. Official Gazette of the United States Patent Office, Vol. 914, No. 4, p 1397, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Ion exchange, Resins, Chromium, Metals, Filtration, *Patents.
Identifiers: Plating wastes, Chromic acid, Regeneration, Sodium chromate, Barium chromate.

A unit for reclaiming plating wastes containing chromic acid has been patented. The rinse liquid, from one of many wash tubs into which plated articles are dipped successively to rinse off the plating solution, is circulated through an ion exchange column, where it passes through a resin layer that removes chromic acid and other impurities before the liquid is returned to the wash tube. Periodically, or when saturated with chromic acid, the resin is regenerated by pumping a solution of caustic soda through the exchange column. This produces a sodium chromate solution to which barium hydroxide is added to produce barium chromate, which is filtered out of the caustic soda solution before the latter is again used for regeneration. (Sandoski-FIRL)
W76-08478

PICKLING WITH HYDROGEN PEROXIDE SOLUTIONS,
P. Fintschenko.
Product Finishing, Vol. 26, No. 9, p 30-33, September, 1973. 4 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Recycling, Water pollution control, Water reuse.
Identifiers: *Hydrogen peroxide pickling, Metal finishing, Zero discharge.

Fabrico Manufacturing Corporation, a major manufacturer of hydrogen peroxide, has investigated the problem of stabilizing peroxide for use in copper pickling. They have developed a hydrogen peroxide product which provides superior stability for pickling applications. Hy-Brite allows most pickling operations to use a hydrogen peroxide pickling process economically. The end products of pickling with hydrogen peroxide are the same as the end products of ordinary acid pickling. However, a peroxide pickle is indefinitely regenerable when used in conjunction with a recovery process. Hydrogen peroxide should only be used in sulfuric acid solutions. The use of peroxide in sulfuric acid for concurrent black and red oxide removal is not recommended unless long pickle times and very low peroxide levels are used. (Sandoski-FIRL)
W76-08479

WATER TREATMENT SYSTEM SAVES 45,000 GALS DAILY.
Plant Operation Management, Vol. 93, No. 4, p 43, October, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Heavy metals, *Ion exchange, Treatment facilities, Resins, Separation techniques, Ion transport, Chromium, Anion exchange, Cation exchange, *Water reuse, Recycling, Illinois, Costs.
Identifiers: Regeneration, Chromium plating wastes.

More stringent effluent restrictions forced the waste effluent treatment facilities for General Electric's chrome plating line at its range products plant in Cicero, Illinois, to develop an effective economical method of treating 45,000 gal of waste water produced daily. The system selected was a two-bed system by Hytek International. Waste water first passes to a column that contains a 35 cu ft bed of Amberlite IR-120 exchange resin. This removes iron, nickel, trivalent chrome, and other cations. The second unit, containing Amberlite IRA-402 exchange resin removes the hexavalent chrome, fluorides, sulfates, chlorides, and miscellaneous anions. The ion exchange resins are automatically regenerated. During regeneration, the unwanted chromate and other ions adsorbed by the resins are removed by a solution of sodium hydroxide. (Sandoski-FIRL)
W76-08480

COOPERATION HELPS ERIE,
Erie City Public Works, Pa.
R. J. Waytenick, Crankshaw, and G.I. Brask.
Water and Wastes Engineering, Vol. 10, No. 9, p 76-77, September, 1973. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, Water pollution control, Treatment facilities, Screens, Pulp and paper industry, Phosphorus, Activated sludge, Sludge treatment, Dewatering, Incineration, Pennsylvania.
Identifiers: Vacuum filters, Step aeration, Joint treatment.

A joint treatment agreement between Erie, Pennsylvania, and the Hammermill Paper Company is part of the city's expansion program for its water pollution control facility. The plan calls for separate screening and grit removals for the municipal flow and separate primary treatment for the municipal and Hammermill flows. Controlled phosphorus removal at substantial savings is achieved because of the phosphorus demand of the Hammermill waste. The secondary treatment units will be based on the use of the step aeration process. Piping and channel arrangements will also permit the use of contact stabilization and conventional treatment processes. The primary settled sludges and the thickened waste activated sludge will be combined and pumped to vacuum filters for dewatering. The filter cake will be incinerated. (Sandoski-FIRL)
W76-08481

PROCESS FOR TREATING WATER-SOLUBLE ORGANIC WASTES,
Texaco, Inc., New York. (Assignee).
E. L. Cole, and H. V. Hess.
United States Patent 3,772,181. Issued November 13, 1973. Official Gazette of the United States Patent Office, Vol. 916, No. 2, p 661, November, 1973. 1 fig.

Descriptors: *Patents, *Organic wastes, *Waste water treatment, *Oxygen, Effluents, Oil wastes, Chemical oxygen demand.

A process has been patented for treating a waste feed stream containing water-soluble organic wastes. These include waste originating in refinery reservoirs, refinery waste streams, refinery pits, and lube oil additive plants. The method involves heating the stream under turbulent flow conditions to temperatures of 400 to 700 F and pressures of 300 to 3100 psi in the presence of air or oxygen, thereby splitting off carbon dioxide. The oxidized waste stream has a considerably reduced chemical oxygen demand and is continuously fed to a hot contacting zone. The waste stream thus is in a heat-exchange relationship with an incoming effluent stream. (Sandoski-FIRL)
W76-08482

POLLUTION PROBLEM SOLVER,
Chrysler Corp. Syracuse, N. Y. New Process Gear Div.
R. M. Bertrand.
Instrumentation, Vol. 25, No. 2, p 3-6, 1973.

Descriptors: *Waste water treatment, *Oil wastes, *Industrial wastes, Waste discharge, *Recycling, Separation techniques, Monitoring, *Water reuse, New York.
Identifiers: Waste reuse.

The Chrysler Corporation's Syracuse, New York, plant has implemented a treatment method in which one operator, working on a single shift, can process 250,000 gallons of waste water. An intricate Honeywell-supplied automation system is utilized whereby the operator can handle treatment sequence that removes free oil for processing and reuse, and reduces the remaining emulsified oils to suspended solids that are acceptable to the local municipal primary sewage treatment plant. The treatment facility is a four-story building surrounded by three 250,000-gallon batch processing tanks. A sewer system receives all waste oils, soluble oil coolants, discharge from floor scrubbers, and drainage from oil storage pads and chip hoppers. The system terminates in two receiving pits and pumping stations. The waste water, after passing through grit separator to remove solids, is pumped into one of the tanks in the treatment facility. Wastes are treated when the level in a batch tank reaches a predetermined height below an overflow weir near top of the

tank. The operator checks a sample of the processed waste water, and if it complies with set limits, the batch tank is drained to a sanitary sewer. Oil accumulating in the water-oil tank is further processed so that it is dewatered and concentrated to a grade economically feasible for disposal to a commercial rerefiner. (Sandoski-FIRL)
W76-08483

REMOVAL OF OIL POLLUTION.
French Patent FR 216289. Issued July 20, 1973. Derwent French Patents Abstracts, Vol. U, No. 40, p D4, July, 1973.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Water pollution control, *Oil wastes, Cellulose, Fibers(Plant).

A treatment method for oil pollution and the removal of suspended materials from water using hydrophobic cellulose fibers has been patented. Polluted water is contacted with a hydrophobic cellulose fiber material which shows an affinity for the suspended matter. The cellulose material is a wood fiber with individual fibers completely coated with a hydrophobic material, such as wax, bitumin, resin, elastomer, or thermoplastic resin, and is molded into a suitable shape before use. The materials may be used to absorb oil, suspensions, slimes, and gels from water up to their volume capacity without sinking. (Sandoski-FIRL)
W76-08484

NEW INCINERATION METHOD SOLVES GREASE PROBLEM IN RICHMOND, PA.,
Philadelphia Water Dept., Pa. Northeast Water Pollution Control Plant.
For primary bibliographic entry see Field 5E.
W76-08485

REVERSE OSMOSIS SYSTEM CORRECTS HIGH BOD WASTES: YIELDS NET OPERATING SAVINGS,
Osmonics, Inc., Hopkins, Minn.
D. D. Spatz.
Filtration Engineering, Vol. 4, No. 4, p 13-15, July/August, 1973. 1 fig, 1 tab.

Descriptors: *Biochemical oxygen demand, *Reverse osmosis, Food processing industry, Costs, *Industrial wastes, *Waste water treatment, Cleaning.
Identifiers: Candy manufacturing industry.

Water, used to lubricate the cutters of a large candy manufacturer was previously discharged after lubricating the cutters. This water solution represented 10,000 gal per 20-hour day of 2-3% sucrose solution, and contained a high BOD waste stream. An evaluation showed that a reverse osmosis system would remove over 99% of the BOD, sucrose, glucose, coconut fines, and coconut oil from the solution. It was established that 25% total solids could be obtained on a continuous basis, and that excellent candy could be made from the concentrate of the reverse osmosis machine. The machine is cleaned daily with a clean-in-place flush of C-S detergent, which is allowed to stand in the machine for one to two hours. When the machine is started up, the C-S solution is flushed out with water and the machine is switched to the sugar solution. Considering only the sugar savings (although the water savings would approach $100 per month) there is a net operating savings of $4025 per month with the reverse osmosis system. (Sandoski-FIRL)
W76-08486

TREATMENT OF EFFLUENT.
South African Patent ZA 7208108. Issued June 22, 1973. Derwent French Patents Abstracts, Vol. U, No. 38, p F1, August, 1973.

Descriptors: *Patents, *Waste water treatment, *Cellulose, Pulp and paper industry, Organic matter, Oxidation, Bleaching wastes, *Pulp wastes, Effluents.
Identifiers: Waste reuse.

A method of treating effluent from a cellulosic pulp bleaching process was patented. An oxygen containing gas is used to treat the effluent in a reactor at 200-375 C and a total pressure sufficient to maintain most of the water in the liquid phase. Organic material is oxidized completely and an alkaline inorganic solution is regenerated, which is suitable for reuse in the bleaching process. (Sandoski-FIRL)
W76-08488

FIBER RECOVERY INCREASES WATER REUSE, REDUCES TREATMENT COST,
Dorr-Oliver, Inc., Stamford, Conn.
R. J. Mattison, and F. J. Brandon.
Paper Trade Journal, Vol. 157, No. 43, p 20-21, October 29, 1973.

Descriptors: Pulp and paper industry, *Water reuse, *Recycling, Centrifugation, *Waste water treatment, *Industrial wastes, Clarification, Waste disposal, *Pulp wastes, Costs, Fibers(Plant).
Identifiers: Fiber wastes rescovery.

Selected, long clean saleable fiber may be recovered by the action of a DSM System for paper mills. The operating device is a screen comprising a series of bars with a wedge-shaped cross-section. The bars are mounted so that the slurry tends to react in a centrifugal fashion. Each bar slices off a predictable layer of slurry, passing only those particles smaller and those fibers shorter than the slot width. Thus the DSM System can separate useful fiber from fines, fillers, and small dirt. A highly detailed study was made at a large tissue mill in Pennsylvania and showed that previously, three flotation clarifiers provided final treatment to 8 to 9 mgd of waste water from 11 paper machines and associated equipment. While these flotation units generally operated efficiently, they often overflowed when slugs of water with as much as 2400 ppm entered the system. Now, the full flow of the mill sewer is run through DSM units to thicken the recovered stock after cyclone cleaning. This stock is returned to the bleach system. Cleaner rejects are added to the clarifier sludge for centrifugal dewatering and disposal. The DSM System recovers 39% of the sewered fiber at 5% consistency. Additional savings result from reuse of some of the sewered water and from reduced maintenance requirements at the flotation clarifiers. (Sandoski-FIRL)
W76-08489

HEAVY METAL SALTS RECOVERY.
West German Patent DT 2230243. Issued October 4, 1973. Derwent German Patents Abstracts, Vol. U, No. 41, p M3, October, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, Reverse osmosis, *Patents, Salts.
Identifiers: *Metal finishing wastes, Metallic salts.

A method for the recovery of heavy metal salts from industrial effluents based on either inorganic or organic solvents has been patented. In this process, effluent is first concentrated and then subjected to reverse osmosis. The method can be used for the recovery of the following metal salts from plating or anodizing bath effluents as well as from dye vat rinses: Pt, Pd, Rh, Au, Ag, Ni, Cu, Zn, Cr, Cd, Fe, and Al. (Sandoski-FIRL)
W76-08490

IMS-GRANGCOLD PELLETIZING SYSTEM FOR STEEL MILL WASTES MATERIAL,
International Mill Service, Philadelphia, Pennsylvania.
H. D. George, and E. B. Boardman.
Iron and Steel Engineer, Vol. 50, No. 11, p 60-64, November, 1973. 7 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Steel, Portland cements, *Byproducts, Recycling.
Identifiers: *Steel making processes, Cold bonded pellets, *Grangcold pelletizing process.

The Swedish Grangcold pelletizing process has been adapted to utilize byproducts of the steel making process such as blast furnace dust and sludge, fine mill scale, fired pellet screenings, coke breeze, and iron fines. The pellet process uses a hydraulic adhesive, portland cement, for the production of cold bonded pellets which are mixed in a suitable amount of the balling concentrate, minus the cement, before storage. The pellets are embedded in the concentrate during initial storage so as to be isolated from each other. The embedding concentrate subjects the pellets to a uniform pressure on all sides which eliminates deformation of the pellet. The mixture can be stored in a stockpile or in a bin until sufficient hardening is obtained. The concentrate is then separated from the pellets by screening and the concentrate recycled to the balling operation. The pellets are shipped either to a blast furnace or stored for final hardening. A 1.5 million tons per year production plant has been operating in Grangesberg, Sweden, for three years. The operation and economics of this plant are detailed. (Sandoski-FIRL)
W76-08491

TREATING WASTE LIQUORS CONTAINING METAL-WORKING OIL EMULSIONS.
West German Patent DT 1594406. Issued September 27, 1973. Derwent German Patents Abstracts, Vol. U, No. 40, p M2, September, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Emulsions, *Patents, Oily water, Adsorption, *Oil wastes, Separation techniques.
Identifiers: Metal working oils, Cutting oils.

A patent for a method of treating waste liquors containing metal-working oil emulsions has been assigned. The wastes are separated into a pure aqueous phase and an oil phase containing the impurities by treating the effluent at its boiling point with a mixture of a cleaving agent and an adsorbent, a hydrophobic silicic acid, for the oil phase. The cleaving agent is either an akaline earth formate or a metal halide, which hydrolizes at the process temperature. Preferably 10 to 50 parts of mixture of silicic acid and alkaline earth formate or Al halide is used on 100 parts of cutting oil concentrate. (Sandoski-FIRL)
W76-08492

METALLIC RECOVERY SYSTEM,
Air Preheater Co., Inc., Wellsville, N. Y. (Assignee).
N. D. Hazzard, and W. M. Anderson.
United States Patent 3,780,676. Issued December 25, 1973. Official Gazette of the United States Patent Office, Vol. 917, No. 4, p 1279-1280, December, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Organic compounds, Inorganic compounds, Oxidation, Heat treatment, Equipment, *Recycling, Water reuse.
Identifiers: *Pyrolysis, Matallic recovery system.

A conversion system for waste containing organic and inorganic components in which the organic components are pyrolyzed in an essentially oxygen-free atmosphere so as to prevent the oxidation of the inorganic constituents has been patented. An afterburner provides the necessary heat for burning pyrolyzed gases and the carbonaceous particulate matter formed in the pyrolyzing chamber. The pyrolyzing chamber is maintained at a suitable temperature for properly

pyrolyzing waste material by cooling the hot gases from the afterburner with cool ambient air and then directing the mixed gases over the pyrolyzing chamber. (Sandoski-FIRL)
W76-08493

EFFLUENT WATER TREATMENT.
Netherlands Patent NL 7304233. Issued October 2, 1973. Derwent Netherlands Patents Abstracts, Vol. U, No. 42, p D2, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Heavy metals, *Ions, Salts, Effluents, Filtration, Drying, Chemical precipitation.
Identifiers: *Metallic salts.

The patented process described involves treating waste water to remove small quantities of heavy metal ions by mixing the water with a mixed salt containing FeS and BaS04 with an excess of sulfide ions. The salts can be formed by mixing BaC12, Na2S, FeS04, and CaC12 in aqueous medium and filtering and drying the precipitate; a molecular ratio for Fe/Ba of 1/1-3/1 and for Fe/Ca of 2/1-1/2 is preferred. Beds of the mixed salt provide for good removal of heavy metal ions from industrial waste water before discharge to rivers or other water bodies. (Sandoski-FIRL)
W76-08494

SETTLING TANK,
I. F. Tikhonov, and G. D. Isaev.
Soviet Patent SU 367874. Issued April 13, 1973. Soviet Inventions Illustrated, Vol. U, No. 41, p J1, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, *Patents, Chemical wastes, *Settling basins, Equipment, Suspended solids, Sedimentation, Separation techniques.
Identifiers: Sloped plates.

A patent has been issued for the removal of suspended solids from industrial effluents. Suspended particles are removed from liquids in the chemical and metallurgical industries by passage through a settling tank in the form of a vertical cylinder with inlet and outlet pipes, a mud-separating pipe, an axial body, microsettlers formed from sloping plates, and mud-retaining baffles. The operational efficiency is augmented by designing the liquid feed system in the form of radial channels open at the peripheral and upper sections, and formed from vertical plates positioned in pairs on the mud-separating pipe. The suspended particles settle out in the micro-settlers. The resultant mud comes out through the slits and down the mud-separating pipe. The clean water goes out through the top. (Sandoski-FIRL)
W76-08495

SOUR WATER TREATMENT PROCESS.
Process Technology, Vol. 18, No. 11, p 421, November, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Byproducts, *Water reuse, Ammonia, Hydrogen sulfide, *Recycling.
Identifiers: Refinery wastes, Sour water, *Sour water stripper.

The Chevron Waste Water Treatment process treats refinery waste water and converts it into three valuable products: high purity hydrogen sulfide; pure ammonia; and treated water for recycle or discharge. Combined feed water from a degassing unit is pumped through a feed heater into a reboiler stripper column where H2S is stripped overhead and water and ammonia flow downwards and out as column bottoms. The column overhead is high purity H2S which contains negligible ammonia and very little hydro-carbons. Bottoms from the first column are fed directly to a second reboiler stripper column. A clean water, suitable for many in-plant needs, is produced while the ammonia overhead product requires further processing to remove small amounts of H2S and sulfur. The economies of the process are very dependent on the feed concentration; a more concentrated feed requires a less expensive plant. (Sandoski-FIRL)
W76-08496

REMOVING FINE PLASTIC PARTICLES FROM WASTE WATER.
Belgian Patent BE 798884. Issued August 16, 1973. Derwent Belgian Patents Report, Vol. U, No. 41, p D2, August, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Chemical wastes, *Patents, *Plastics, Surfactants, Foaming.
Identifiers: *Polyvinyl chloride.

A patent for a method of removing fine particles of plastic material, especially polyvinyl chloride, from waste water has been granted. This treatment process includes the following steps: adding a surfactant which produces a foam in the waste water; subjecting the waste water to the action of a stream of gas bubbles; and, removing the foam which has accumulated at the surface of the bath and contains a high concentration of fine plastic particles by raking. Essentially complete removal of the fine plastic particles from the waste water is achieved using a relatively small quantity of surface active agent. (Sandoski-FIRL)
W76-08497

SLURRY-BURNING PROCESS.
Process Technology, Vol. 18, No. 11, p 423, November, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Waste disposal, *Incineration, Operating costs, Capital costs, *Slurries, *Oil wastes, Organic compounds.
Identifiers: Refinery wastes.

A combustion process developed by Wintershall A. G., has simplified the disposal of bulk acid and hydrocarbon refinery wastes. The slurry-burning process, which can be used with any type of furnace, employs a newly designed burner and a single homogenizing pump. A pre-heated mixture of solids and combustible liquids is drawn from a tank by the pump which homogenizes the mixture and pumps the slurry to the burner. The burner is in a casing which supplies secondary air to cool the burner pipe and jet, and to adjust the length and shape of the flame with respect to the conditions in the furnace. Extra air required for complete combustion is drawn through the furnace port at a rate controlled by the combustion process. The process has a 55 percent reduction in operating costs and 50 percent reduction in capital costs compared to conventional processes. (Sandoski-FIRL)
W76-08498

DETERMINATION OF TRACES OF CARBON IN SOLID AND LIQUID WASTES OF CHEMICAL PLANTS BY MEANS OF THERMAL CONDUCTIVITY MEASUREMENTS (BESTIMMUNG VON SPUREN KOHLENSTOFF IN FESTEN UND FLUESSIGEN ABFALLSTOFFEN DER CHEMISCHEN INDUSTRIE MIT HILFE DER WAERMELEITFAEHIGKEITSMESSUNG),
Farbwerke Hoechst, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5A.
W76-08499

RAPSON IDEA SET FOR MILL TRIALS.
Canadian Chemical Processing, Vol. 57, No. 11, p 33-34, November, 1973. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Filtration, Evaporation, Crystallization, Sodium chloride, *Pulp wastes, Utah, Recycling, Water reuse.
Identifiers: *Salt recovery process(Reeve/Rapon), Bleached kraft mill effluents, White liquor.

The Reeve/Rapson Salt Recovery Process (SRP) will soon be tested for use in treating bleached kraft mill effluents. In the SRP system, the precipitate from white liquor is recovered by filtration and then leached with water to redissolve the carbonate. The remaining solid is pure NaCl which can either be sold or used on-site to generate bleaching chemicals such as chlorine dioxide, chlorine, or caustic soda. During pilot studies at Salt Lake City, Utah, the white liquor evaporation system was modified to include two evaporator-crystallizer stages. The liquor from the recausticizing plant is concentrated in the first stage to 26-30 weight percent NaOH plus Na2S at a final liquor temperature between 250 and 260 F. Over 80 percent of the water is evaporated in stage 1; the second stage accounts for slightly less than 20 percent. Stage 2 operates at a lower temperature range, 165-200 F, and produces a white liquor concentration from 36-42 weight percent NaOH + Na2S. The NaC1 is crystallized out, as well as anhydrous Na2C03 and additional burkeite salt. The final white liquor concentrate contains small amounts of salt, soda ash, and saltcake; the active alkali content was sufficient for pulping. (Sandoski-FIRL)
W76-08500

DETERMINING OIL CONTENT, IN WATER.
For primary bibliographic entry see Field 5A.
W76-08501

LIBBY, MCNEILL SOLVES AN ODOR PROBLEM,
H. W. Stone, and J. V. Ziemba.
Food Engineering, Vol. 45, No. 12, p 99-100, December, 1973. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, *Odor, Equipment, Water reuse, Biochemical oxygen demand, Wisconsin.
Identifiers: *Beet peeling system.

A new waste-eliminating beet peeling system coupled with controlled chemical treatment installed at the Libby, McNeill and Libby Wisconsin cannery has reduced the BOD from 3500-4000 ppm to 50-75 ppm after lagooning and caused a significant drop in the hydraulic load from 1.25 to 0.60 mgd. Installed to eliminate the odor problem, equipment costs together with an improvement program ran approximately $100,000. Measures are being initiated to minimize production of waste and to conserve water by recycling. Over 99 percent of the solid beet matter is screened from effluent before it leaves the cannery. Two new magnascrubbers, developed by Magnuson Engineering, eliminate peel waste from the regular effluent and the number of 5-hp Dunkley aerators installed in the lagoons has almost doubled, from 24 to 42 in two years. (Sandoski-FIRL)
W76-08502

ANIMAL FOOD.
French Patent FR 2165034. Issued August 3, 1973. Derwent French Patents Abstracts, Vol. U, No. 42, p D5, August, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, *Patents, Yeasts, Foods, Pollution abatement.
Identifiers: Beet pulp, Fermentation wastes.

An industrial pollution abatement measure has been patented. Waste disposal is eliminated by an animal food process which utilizes beet pulp or yeast wastes from alcoholic fermentation. The animal food contains a mixture of dried beet pulp waste containing 20 percent cellulose and 30 percent other glucides on a dry weight basis and more than one yeast from either alcoholic fermentation

or wine distillation which are 40-50 percent protein rich and of high vitamin B content. The food contains 10-16 percent proteins, 3-4 percent fats, and 15-18 percent cellulosics. Other ingredients are wheat and maize. (Sandoski-FIRL)
W76-08503

DRY CAUSTIC PEELING OF BEETS AND CARROTS REDUCES POLLUTION,
New York State Agricultural Experiment Station, Geneva. Dept. of Food Science and Technology.
C. Y. Lee, and D. L. Downing.
Food Technology, Vol. 27, No. 12, p 40-41, 44-45, December, 1973. 7 fig. 2 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Pollution abatement, Water conservation, Water demand, Suspended solids, Chemical oxygen demand, Biochemical oxygen demand.
Identifiers: *Dry caustic peeling.

A preliminary pilot plant experiment conducted in early 1972 on the dry caustic peeling of beets and carrots offered a promising approach to the problems of cannery waste and processing yield. The conditions for continuous commercial-scale operation for the dry caustic peeling of beets were established by conducting pilot-plant and commercial scale tests during the 1972 processing season. A systematic survey of the peeling operation to measure peel loss, water consumption, and other factors pertaining to the measurement of pollutants was conducted on both the conventional lye peeling operation and the dry caustic method. In continuous processing of beets at the rate of 8 ton/hour, peeling loss for conventional peeling was around 30%, while dry caustic peeling showed only a 21% loss. A 75% reduction in water usage and an 85% reduction of total solids waste from the peeling line were effected by the dry caustic peeling method. Suspended solids were reduced from 4.3 lb/ton to 0.5 lb/ton and COD and BOD were reduced more than 90% by the dry caustic procedure. Results from testing for carrot processing showed similar reductions by using the dry caustic peeling method. (Sandoski-FIRL)
W76-08504

PURIFICATION OF WASTE WATER.
West German Patent DT 1658043. Issued October 18, 1975. Derwent German Patent Abstracts, Vol. U, No. 43, p D1, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, *Patents, Nitrogen compounds, Fermentation, Biological treatment, Fermentation, Potatoes, Sulfite liquors, Chemical precipitation, Water purification.
Identifiers: Lignin sulfonic acids.

A purification system for waste water from a potato factory has been patented. Under this patent, waste water containing proteins, polypeptides, and other nitrogenous compounds is treated with lignin sulfonic acids or their salts preferably in more than two stages to precipitate the nitrogenous matter. After the precipitated material is filtered, the remaining liquid is subjected to fermentation with a suitable organism and/or to biological purification. The lignin sulfonic acids or salts used may have different molecular weights and may be sulfite waste liquors. (Sandoski-FIRL)
W76-08505

SULPHURIC ACID CONTAINING RINSES, PURIFICATION,
R. K. Alekseeva, A. I. Ivanov, and V. I. Polevshchikov.
Soviet Patent SU 368186. Issued April 9, 1973. Soviet Inventions Illustrated, Vol. U, No. 41, p 2, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Ion exchange, Resins, Heavy metals, *Patents, Sodium chloride, Ions.
Identifiers: *Sulfuric acid.

The conventional method for the removal of heavy metals such as lead, zinc, and cadmium from solutions by sorption of the metals as chloride complexes on an anion-exchange resin cannot be used for purification of solutions containing sulfuric acid. However, by this patented process, the drawback is overcome by the preliminary addition of chloride ions, such as, sodium chloride in a concentration less than 50 grams per liter. This permits utilization of waste solutions from the production of sulfuric acid by the contact process in the electrolytic manufacture of nickel. It provides for the preparation of the electrolyte and for maintaining a constant amount of chloride ions in it. (Sandoski-FIRL)
W76-08506

DECONTAMINATION OF WASTEWATERS AT THE STAGE OF POTASSIUM ARABONATE IN THE PRODUCTION OF VITAMIN B2, (IN RUSSIAN),
All-Union Scientific Research Inst. for Vitamins, Moscow (USSR),
E. A. Pan'kov, N. F. Zoteeva, and G. P. Chernysh.
Khim-Farm Zh. 9(2), p 53-54, 1975.

Descriptors: *Waste water treatment, Vitamins, Oxygen, Chemical wastes, *Potassium compounds, *Vitamin B, Fertilizers, Acidic water, Chemical oxygen demand, Biochemical oxygen demand.
Identifiers: *Potassium arabonate.

A method of decontaminating the wastewater of the potassium arabonate stage in vitamin B2 production by using the wastes of mineral acids of other vitamin production reduces the initial absolute value of the chemical O2 demand of the wastewater discharge by 2.5-3 times, reduces the quantity of acidic wastewater entering the neutralization station and permits extraction of the mineral part of the effluent as K salts suitable as fertilizers. The wastewater before contamination is toxic to or lowers the chemical and biochemical O2 demand of microorganisms in biological purification systems.--Copyright 1976, Biological Abstracts, Inc.
W76-08578

STUDY OF THE EFFECTIVENESS OF REMOVING HEAVY METALS IN BIOLOGICAL PURIFICATION OF MUNICIPAL SEWAGE, (IN RUSSIAN),
T. M. Savranskaya.
Gig Sanit. 3, p 120-122, 1975.

Descriptors: Sewage, *Municipal wastes, *Activated sludge, Sludge, Mathematical studies, *Equations, Aeration, *Heavy metals, Water pollution sources, *Waste water treatment.
Identifiers: Michaelis-Menten equations.

The process of heavy metal removal by activated sludge is described by a modified Michaelis-Menten equation. The effectiveness of heavy metal removal in biological municipal sewage treatment depends mainly on the chemical properties and initial concentrations of metals. Relationships were obtained which enable evaluation of the degree of heavy metal removal from sewage at aeration plants.--Copyright 1976, Biological Abstracts, Inc.
W76-08580

HYGIENIC SUBSTANTIATION OF THE POSSIBILITY OF WASTEWATER TREATMENT OF POULTRY PROCESSING PLANTS ON UNDERGROUND FILTER BEDS, (IN RUSSIAN),
Meditsinskii Institut, Kiev (USSR).
E. I. Goncharuk, and O. P. Polovtsev.
Gig Sanit. 1, p 95-97, 1975.

Descriptors: *Waste water treatment, *Filtration, *Poultry, Farm wastes, Filters, Underground.
Identifiers: *Underground filter beds.

In an integrated poultry processing plant consisting of 4 poultry farms of 72,000 layers each and each producing 10.5 m3 wastewater daily, underground filter beds with hydraulic loads of up to 40 l wastewater/day per 1 linear meter of irrigation drains network for medium-grained sandy soils are recommended for wastewater treatment.--Copyright 1976, Biological Abstracts, Inc.
W76-08581

BACTERIAL CONTAMINATION OF PERENNIAL GRASSES IN OVERHEAD IRRIGATION WITH SEWAGE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Vilnius (USSR).
A. K. Baubinas.
Gig Sanit. 1, p 97-99, 1975.

Descriptors: *Grasses, *Irrigation practices, *Irrigation effects, Sewage bacteria, *Sewage, E. Coli, Microorganisms, Water pollution.
Identifiers: Enterococci, Perennial grasses.

The bacterial contamination of perennial grasses by Escherichia coli, enterococci and pathogenic microorganisms during and after overhead irrigation with sewage at sewage farms was studied. The bacteria in the sewage during overhead irrigation can be carried far by air currents, leading to massive contamination of the grass. The microorganisms on the plants exposed to direct solar rays generally die off within 1 wk. Grazing of cattle 14 days after irrigation is safe.--Copyright 1976, Biological Abstracts, Inc.
W76-08582

DESALTING HANDBOOK FOR PLANNERS.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 3A.
W76-08584

EVALUATION OF MINERALIZATION PROCESSES FOR SRP WASTES,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5G.
W76-08595

PHOSPHORUS MOVEMENT IN SOILS: SOIL-ORTHOPHOSPHATE REACTION KINETICS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-08672

A FRAMEWORK FOR EVALUATING INSTITUTIONAL AND SOCIO-ECONOMIC ISSUES OF LAND TREATMENT OF WASTE WATER,
Economic Research Service, Upper Darby, Pa.
L. A. Christensen.
Journal of Environmental Quality, Vol. 4, No. 2, p 145-153, April-June 1975. 1 fig, 1 tab, 27 ref.

Descriptors: *Waste water disposal, *Waste water treatment, *Land management, *Institutional constraints, Research priorities, Agriculture, Social aspects, Water reuse.
Identifiers: Land treatment.

Land treatment of waste waters is receiving considerable attention as a waste water management alternative to meet water quality requirements. The many questions raised with the land treatment approach encourage a multidisciplinary planning approach. The systematic investigation of institutional and economic questions should be made concurrent with technical and engineering studies. An investigation of this waste water treatment al-

ternative must address the questions of (i) what institutional arrangements will be used to acquire the use of the necessary land, and (ii) how the land treatment system will be managed. Many factors influence the acreage required for land treatment systems including community size, the type of waste water being treated, management systems used, land availability, and soil type. An extensive area would be required for a large metropolitan area such as Detroit. Smaller communities or power plants would require less area. A number of ways to acquire rights to land are suggested, each with different implications for the affected farmers and the authority responsible for the operation of the system. These include fee simple acquisition, easement purchases, and the formation of waste water cooperatives. Some potential management options for fee simple sites include purchase and manage, and purchase and leaseback. (Skogerboe-Colorado State)
W76-08681

RESOURCE RECOVERY: POSSIBILITIES AND PITFALLS,
International City Management Association, Washington, D.C. Management Development Center.
R. J. Bartolotta.
Solid Wastes Management Vol. 18, No. 11, p. 52, 54, 58, 1975. 2 fig.

Descriptors: *Waste treatment, *Recycling, *Risks, Financing, Project planning, Decision making, Engineers estimates, Marketing.
Identifiers: *Resource recovery.

Basic, non-technical waste recycling implementation questions are discussed. Larger cities generally have a better chance of starting a resource recovery system; economics and market availability for recycled products (especially energy) are important factors in determining feasibility. Building a resource recovery system is expensive and risky, involving more financing, operational, and procurement options than other major capital improvement projects. The approach to major organizational options for resource recovery should be carefully explored and analyzed in terms of each city's needs and constraints. Thorough planning is critical to the success of a resource recovery system, requiring time, manpower, and financing. Requests for proposals should contain specifics about the form, level and organizational level of services. The three most common mistakes which have been made involve markets, choice of consultants, and the development of requests for proposals. Before planning is started, existing facilities should be visited to discuss decision making processes involved in implementation of the system. The EPA's Resource Recovery Division is preparing a resource recovery plant implementation series which will probably include guides on planning for resource recovery implementation and for managing the implementation process. (Buchanan-Davidson--Wisconsin).
W76-08692

REFUSE INTO POWER,
Louisville Univ., Ky. Dept. of civil Engineering.
D. J. Hagerty.
Solid Wastes Management Vol. 18, No. 11, p. 42, 44, 86, 90-91, 1975.

Descriptors: *Recycling, *Solid wastes, *Energy, *Fuels, Byproducts, *Incineration, Design criteria, Steam, United States, Foreign countries, Gases, Oil, Cooling, Heating, Capital cost, Operating costs.
Identifiers: Pyrolysis, Water-tube wall incinerators, Japan, England, Heat reclamation.

The first part of a report on the proceedings of an international symposium on energy recovery from solid wastes held in Louisville, Kentucky, is presented. The background, extent of the energy crisis, and amount of potential energy in refuse are discussed and feasible recovery systems in use are described. If a new energy source can be tapped and its waste products eliminated without detrimental effects, much can be gained. Results with refuse, especially urban solid wastes, are very promising. Solid waste characteristics and systems designed for energy recovery are discussed. One system use as a heat recovery method from refuse is the water-tube wall incinerator. Design considerations in the development of heat recovery plants are given. Pyrolysis is an advantageous method of recovering energy from refuse, since energy can be recovered through heat recovery facilities near the pyrolysis plant fuel (gas, liquid, or char). Waste heat utilization schemes used in Japan, Nashville (Tennessee) and England are described. (Buchanan-Davidson--Wisconsin).
W76-08693

PAPER MAKING WASTE-WATER PURIFICATION.
Netherlands Patent NL 7409-304. Issued January 13, 1976. Derwent Netherlands Patents Abstracts, Vol. X, No. 5, p D1, March, 1976.

Descriptors: Pulp and paper industry, *Waste water treatment, *Patents, *Flocculation, Separation techniques, *Filtration, Recycling, Solids removal, Solid wastes, *Pulp wastes.

Solid components are filtered from paper production waste waters by a patented process. Components consisting of printed waste-paper are flocculated. The flocculate is separated and divided into a fibrous mass and a fiber-free suspension waste materials in water. A filter aid is added which consists of material removed mechanically from the paper pulp before paper preparation. The solid waste material is then separated by filtration or centrifugation. The process recover fibers for addition to the pulp. (Kramer-FIRL)
W76-08695

PRESSURIZED OXIDATION OF PULP SPENT LIQUOR (PARUPU HAIEKI NO KAATSU SNAKA),
T. Kutsuki.
Japan Tappi, Vol. 30, No. 2, p 83-89, February, 1976. 6 fig, 5 tab, 5 ref.

Descriptors: Pulp and paper industry, *Waste water treatment, *Industrial wastes, Pressure, *Oxidation, Liquid wastes, *Pulp wastes.
Identifiers: *Pressurized oxidation method.

A pressurized oxidation method to treat sodium sulfide (Na2S) in weak white, weak black, and strong black liquors from kraft pulp manufacturing processes is described. This method prevents hydrogen sulfide (H2S) formation during the reaction between Na2S and recovery boiler waste gases. In a laboratory experiment at ambient pressure, Na2S oxidation occurred most easily for the weak black liquor and least for the weak white liquor. More than 90% Na2S oxidation was required to eliminate hydrogen sulfide odors. Using a small scale apparatus, the Na2S air-oxidations at various pressure conditions were compared. For the oxidation of weak white liquor containing 6.59 g Na2S/liter, the operating conditions of 6 kg/sq cm G pressure could give more than 90% Na2S oxidation in a 20 minute reaction time at 120 C. For an operation with the same liquor at ambient pressure, 30% Na2S oxidation was achieved in 20 minutes reaction time at 80 C and 120 minutes were required to achieve 90% oxidation. This operation also required a larger air supply. For the oxidation of weak black liquor containing 5.80 g Na2S/liter, the pressurized condition (3 kg/sq cm G) operation gave 99.1% Na2S oxidation by supplying air in an amount 200% of the theoretically required amount, while the ambient pressure operation gave only 67.7% Na2S oxidation. Thus, Na2S oxidation was more efficient when conducted under pressurized conditions than under ambient ones for all three types of liquors. Based on collected data, a commercial scale facility was constructed for the pressurized air-oxidation of Na2S in weak white liquors and strong black liquors. (Katayama-FIRL)
W76-08696

THE LONG HARD ROAD TO THE EFFLUENT-FREE PULP MILL,
D. W. Emmerson.
Chemistry in Canada, Vol. 28, No. 4, p 11-13, April, 1976. 2 fig.

Descriptors: Pulp and paper industry, *Pulp wastes, *Industrial wastes, *Waste water treatment, *Recycling, Water reuse, Effluents.
Identifiers: *Bleaching, *Salt recovery process.

Facilities for the first effluent-free bleached kraft pulp mill will be installed at the Great Lakes Paper Company, Thunder Bay, Ontario, to permit complete recycling of all process effluents. The newly developed Erco Envirotech Salt Recovery process will be implemented and bleach plant effluent will be introduced into the chemical recovery system. The five stages in a pulp bleachery are chlorination, caustic extraction, C102, caustic extraction, and C102. In this system, 70% of the available C12 in the first stage is replaced with C102, thus decreasing the salt load. The replacement gives a stronger and more stable pulp with a higher yield, eliminates the effluent toxicity, and decreases the effluent color by one-half. As an integral part of the new pulp mill, a chlorine dioxide generating system is being installed, with a capacity of 28 tons per day C102. The use of the Salt Recovery process offers a better alternative to conventional primary and secondary waste water treatment. The process recovers salts produced when spent bleaching chemicals are recycled. Cooking liquor is concentrated and purged of contaminating salts. The stages involve evaporation, crystallization, leaching and filtration. Salts can be reused for the manufacture of chemicals and the white liquor is used for pulping. The salt recovery process uses only about one-sixth as much fresh water as a conventional mill and has a net energy saving of 5000 lb of steam per ton of pulp. A typical 900 ton/day mill saves about $4 million per year through its lowered costs for chemicals, water, and energy and its higher pulp yield. (Kramer-FIRL)
W76-08698

BIOLOGICAL PROCESSES FOR EFFLUENT AND WASTE TREATMENT EXEMPLIFIED BY THE PAPER INDUSTRY (BIOLOGISCHE VERFAHREN ZUR ABWASSER- UND ABFALLAUFBEREITUNG AM BEISPIEL DER PAPER-INDUSTRIE),
B. Morgeli, and J. Gnieser.
Gas-Wasser-Abfall, Vol. 56, No. 3, p 135-139, 1976. 7 fig, 1 tab, 10 ref.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Biological treatment, *Industrial wastes, *Waste water treatment, Effluents, Pilot plants, Treatment facilities.
Identifiers: Protein recovery.

A controlled biological process for waste water treatment in the paper industry is described. Fluctuations in the quality and quantity of the effluents, as well as the requirement of protein recovery from the waste water made it necessary to develop a biological process control through the measurement of pH, conductivity, and other readily measurable parameters. A pilot plant developed for this process consists of two aeration basins and a return sludge aeration basin in which the microorganisms of the return sludge are kept viable for repeated use after prolonged interruptions in the waste water supply. (Takacs-FIRL)
W76-08699

THE EFFLUENT TREATMENT SYSTEM AND UTILIZATION OF RECYCLED WATER IN THE IYOMISHIMA MILL (DAIO SEISHI MISHIMA KOJO NI OKERU SOGO HAISUI SHORI TO HAISUI NO SAIRIYO),
K. Murakami.
Japan Tappi, Vol. 30, No. 2, p 76-82, February, 1976. 2 fig, 2 tab.

Descriptors: *Pulp and paper industry, *Recycling, *Waste water treatment, *Pulp wastes, *Industrial wastes, Treatment facilities, Chemical oxygen demand.

The waste water recirculation system in operation at the pulp and paper mill of the Taio Paper Manufacturing Co., Japan, is described. The mill uses 300,000 cu m/day water to produce 5100 tons of paper-pulp products; this consists of 270,000 cu m/day waste water plus 30,000 cu m/day evaporation loss. Of the waste water generated, 100,000 cu m/day is recirculated and 200,000 cu m/day discharged to the sea. Waste waters from individual mill processes are combined and treated by two independent systems. The waste water treated by the first system is not recirculated, and all of the water treated (100,000 cu m/day) by the system is discharged to the sea. The system utilizes a precipitation method with primary and secondary clarifiers. The second system, which treats 170,000 cu m/day waste water, consists of a first settling basin, an aeration basin, a secondary settling basin, and a clarifier. Of the water treated by this process, 70,000 cu m/day is discharged into the sea, together with the water treated by the first system; the other 100,000 cu m/day are recycled. The average quality of the mill-generated water before treatment is SS, 460 ppm; COD, 520 ppm; and BOD, 250 ppm. The quality of the water discharged to the sea is pH, 6.7; SS, 37 ppm; and COD, 123 ppm; the recirculating water quality averages pH, 5.7; SS, 37 ppm; COD, 70 ppm; and BOD, 20 ppm. (Katayama-FIRL)
W76-08700

RECYCLING--EXAMPLES FOR ITS POSSIBILITIES AND LIMITS (RECYCLING--BEISPIELE FUER MOEGLICHKEITEN UND GRENZEN),
A. Hackl.
Oeterreichische Chemie-Zeitschrift, Vol. 77, No. 1, p 1-5, January, 1976. 4 fig, 3 tab, 9 ref.

Descriptors: *Industrial wastes, *Recycling, *Water reuse, Acids, Rivers, Waste disposal, *Pulp wastes, Waste water treatment, *Europe.
Identifiers: Sulfuric acid, *Lenzinger process.

Problems and possibilities of waste recycling in Europe are reviewed. Dilute sulfuric acid, generated as a by-product in many chemical processes, can be concentrated for reuse to 70% and more by the Chemico immersion heater method. The use of this method is, however, often limited by the costs involved. Sulfuric acid waste with concentrations under 10% is often dumped in rivers or at sea. A recycling rate of 80% can be achieved by the Lenzinger process for the recycling of magnesium disulfite in pulp-making. (Takacs-FIRL)
W76-08701

CHEMICAL CLARIFICATION OF WASTE WATER.
Belgian Patent BE 831-077. Issued November 3, 1975. Derwent Belgian Patents Abstracts, Vol. W, No. 49, p D3, January, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Oil, *Chemical precipitation, Flocculation, Sedimentation, Sludge treatment, *Recycling.
Identifiers: *Chemical clarification, *Chemical treatment.

A process for the chemical treatment of waste water has been patented in which the resulting precipitate is dissolved to provide soluble salts for recycling in a clarification process. Industrial effluent is clarified with an agent such as A1(OH)3, Fe(OH)3 or CaCO3. In a clarification tank, the agent is added to the effluent together with a solution of salt containing the cation of the clarification agent. For example, with CaCO3 as the clarifier, the salt would be CaC12. The solution is introduced to provide 10 to 100 g salt/cu m. The precipitate from the bottom of the tank is piped to a dissolving tank and treated with an organic acid or detergents to form soluble salts of the clarification agent. Then, 80% or more of this solution is recycled to the clarification tank and the balance of the solution is drained off. Floating hydrocarbons are skimmed from the surfaces of both the dissolving and clarifying tanks and can be removed by adsorption on synthetic resins. The effluent may be purified to the quality of potable or industrial water. (Kramer-FIRL)
W76-08702

FLUORIDE REMOVAL: TECHNOLOGY AND COST ESTIMATES,
C. L. Parker, and C. C. Fong.
Industrial Wastes, Vol. 21, No. 6, p 23-27, November/December, 1975. 6 fig, 4 tab, 9 ref.

Descriptors: *Industrial wastes, *Fluorides, Laboratory tests, *Waste water treatment, Metals, *Chemical precipitation, *Lime, *Adsorption, Costs.
Identifiers: *Fluoride removal.

Fluorides are removed from waste water most efficiently and economically at the highest practical concentration and the lowest waste water volume. The treatment technology and costs for the removal of fluoride in concentrations between 20 mg/liter and 100 mg/liter have been evaluated. Soluble fluorides occur in a variety of industrial waste waters for discharge to navigable water ways, including electronics and ceramics manufacture, and the glass, aircraft, and metals industries. Three types of treatment technology investigated in the laboratory were: lime precipitation of calcium fluorides; alum treatment; and adsorption of fluoride on alumina. Findings revealed that lime treatment costs and the residual fluoride levels achieved for dilute solutions were dependent upon both pH level and other dissolved ions. Optimum pH level must be chosen on the basis of specific need. Once minimum fluoride levels achievable by lime addition are obtained, further reduction may be attained by using either alum or alumina adsorption. Fluoride removal by lime and alum is possible down to one to four mg/liter residual fluoride. Below about ten mg/liter, residual fluoride alumina treatment costs are close to those for lime treatment. (Kramer-FIRL)
W76-08703

THE EFFECTIVE MANAGEMENT OF WASTE.
Australian Chemical Engineering, p 15-19, November/December, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Waste treatment, Cost-benefit analysis, *Recycling, Metals, Toxicity, Oily water, Europe, Management.

Three approaches to waste management in European countries are discussed. These are the reduction of the total quantity of waste generated, the extraction of maximum benefit from waste materials, and the elimination of environmental hazards associated with waste disposal. Examples of the waste management problems common to several industries are provided. These include those wastes from packaging industries, including glass, metals, paper, cardboard, plastics, wood and textiles; from livestock rearing; from metal fabricating operations; from solvents in the paint and pharmaceutical industries; and from the oil refining, storage, and transporting industries. Certain waste materials, such as scrap iron, are presently marketed. Other wastes, including oils, have a potential market value, often not realized. Toxic and hazardous wastes have only a negative value. Policy instruments in the management of industrial wastes include direct regulation and economic incentives, such as the taxation of those groups which generate wastes or the subsidizing of groups which engage in effective waste treatment and disposal. (Kramer-FIRL)
W76-08704

PURIFYING-DEMICROBISING WASTE-WATER.
Netherlands Patent NL 7508-499. Issued February 2, 1976. Derwent Netherlands Patents Abstracts, Vol. X, No. 7, p D1, March, 1976.

Descriptors: *Waste water treatment, *Microorganisms, *Organic compounds, *Patents, *Pulp wastes, Textiles, *Industrial wastes, *Biodegradation, Color, *Bacteria.
Identifiers: Lactic acid bacteria.

A method has been patented for removing pathogenic microbes and dissolved organic materials from various effluents, including those from paper mills, textile mills, and glue works. Lactic acid bacteria are added to the liquid and the temperature and pH of the liquid are controlled so as to promote bacterial growth. This process efficiently destroys pathogenic bacteria and biologically degrades organic materials in the heavily polluted waste water. The treated water will be colorless, neutral, and practically microbe-free. (Kramer-FIRL)
W76-08705

THE ELECTROLYTIC PROCESSING OF CYANIDE WASTES,
J. E. Entwistle.
Effluent and Water Treatment Journal, Vol. 16, No. 3, p 123-128, March, 1976. 4 fig, 3 ref.

Descriptors: *Waste water treatment, Metals, Waste disposal, Heat treatment, *Electrolysis, Oxidation, Pilot plants, Laboratory tests, *Industrial wastes, *Treatment facilities.
Identifiers: *Metal finishing industry, *Cyanide wastes.

Cyanide-containing wastes produced in the engineering and metal finishing industries include electro-plating wastes and heat treatment salt residues (HTR). An investigation of various means of disposing of these wastes, in particular the HTR wastes, was conducted. Methods compared included incineration, biological treatment, combustion of HCN liberated by acid addition, chlorination at high pH, and electrolytic oxidation. Of these methods, electrolytic oxidation seemed to be the most cost-effective. Electrolytic oxidation also had the advantages over the other methods investigated in that heavy metal recovery appeared to be possible as a parallel cathodic process within the system. A series of laboratory and pilot plant studies were done. On the basis of these trials, a 5000 amp closed cycle installation for the processing of heat treatment salt residues was constructed. The installation consisted of the four stages of spray dissolution, settlement, electrolysis, and cyrstallization. After six months of operation, data were accumulated for the development of a more advanced 5000 amp variable geometry unit, capable of simultaneous cyanide destruction and metal recovery. The process has been shown to produce a final effluent substantially free from heavy metals; copper, zinc, or cadmium present in the electrolyte plates out on the cathode and is recoverable. Additionally, the electrolytic oxidation process is effective in treating metal cyanide complexes such as tetracyanonickelate and hexacyanoferrate. (Kramer-FIRL)
W76-08706

STUDIES CONCERNING OIL REMOVAL FROM MILL SCALE (UNTERSUCHUNGEN ZUR ENTOELUNG VON WALZZUNDER),
A. Supp, and K. Zimmermann.
Technische Mitteilungen Krupp Forschungsberichte, Vol. 33, No. 3, p 89-92, 1975. 3 fig, 2 ref.

Descriptors: *Industrial wastes, *Waste water treatment, Oily water, *Metals, *Oil wastes, Costs, *Recycling, *Separation techniques, *Centrifugation.
Identifiers: Rolling mills, Mill scales.

A method for oil removal from mill scale retained on gravel filters in a hot broad strip roll mill is described. The dilute sludge obtained during the scavenging of the gravel filter undergoes preliminary dewatering, after which it is treated with alkaline detergents at high temperature in a mixing tank. After phase separation, the solid particles (mill scales) are separated by centrifugation and recycled in the ore dressing process. Oil suitable for recycling in the rolling process is recovered. The specific cost amounts to 35 DM/ton of treated scale. (Takacs-FIRL)
W76-08707

CLEARING OF TITANIUM- AND ALUMINIUM-CONTAINING EFFLUENT WATERS.
Belgian Patent BE 831-477. Issued January 19, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 7, p D3, March, 1976.

Descriptors: *Patents, *Chemical wastes, Chemical industry, *Chemical precipitation, *Industrial wastes, *Waste water treatment, *Aluminum, Flocculation.
Identifiers: Polyalkene production wastes, *Titanium.

Treatment of titanium- and aluminum-containing effluent waters is effected by a patented method. These effluents, from polyalkene production using Ziegler catalysts, are treated by adjusting the pH to between 4.5 and 9.5 and separating the resulting aluminum- or titanium-containing precipitate. The process is necessary to prevent the build up deposits of titanium and aluminum salts in the pipework and pumps of treatment units of polyalkene production plants. The pH is adjusted with the use of HC1, H2SO4, NaOH, or Na2CO3 and the precipitation of the titanium and aluminum compounds is promoted with the addition of a flocculant such as 0.5 to 1% of a polyacrylamide. (Kramer-FIRL)
W76-08708

ELECTROLYTIC PURIFICATION OF TRADE EFFLUENTS CONTAINING TOXIC MATERIALS,
A. Paudrat.
French Patent 2265-691. Issued November 28, 1975. Derwent French Patents Abstracts, Vol. X, No. 3, p D5, February, 1976.

Descriptors: *Patents, *Waste water treatment, *Toxicity, *Metals, *Industrial wastes, Treatment facilities, Equipment, Oxidation, Measurement, *Electrolysis, Ions.
Identifiers: Hexavalent chromium ions, Cyanides ions.

A method has been patented for the continuous treatment of effluents containing soluble toxic molecules, such as cyanide and hexavalent chromium ions. In this electrolytic process, effluent is introduced under pressure into the outer tank of a system of three concentric vertical cylindrical tanks with a common base. The pH is measured by electrodes and adjusted. Liquid overflows from the outer to the intermediate tank and then through ports to the center tank. Electrodes measure the oxidation-reduction potential and compressed air is introduced through a perforated pipe to stir the reacting materials. The cyanide ions are destroyed by oxidation with oxygen, ozone, or hypochlorite; hexavalent chromium is reduced to non-toxic trivalent chromium by ferrous sulfate and alkali sulfites and bisulfites. Treated effluent is fed to a settlement tank. (Kramer-FIRL)
W76-08709

HIGH-GRADIENT MAGNETIC FILTRATION OF STEEL PLANT WASTE WATER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
M. J. McNallan, K. C. Russell, J. A. Oberteuffer, and J. B. See.
Iron and Steel Engineer, Vol. 53, No. 1, p 40-44, January, 1976. 4 fig, 1 tab, 13 ref.

Descriptors: *Industrial wastes, *Steel, *Iron, *Filtration, *Separation techniques, *Waste water treatment, Suspended solids.
Identifiers: *Magnetic filtration.

Laboratory tests showed that high-gradient magnetic separation, a technique which permits removal of weakly magnetic, micro-size particles from water at higher process flow rates than conventional technologies, is effective in removing fine ferromagnetic iron oxide solids from steel plant waste water. A bench scale magnetic separator was used to clean samples from blast furnace wash water and oxygen furnace evaporation chamber water, achieving 5 to 20 ppm suspended solids at process flow rates of 18 to 200 gpm/sq ft. For certain effluents, the suspended solids concentration of the dust bearing waste water was reduced to less than 5 mg/liter with a single pass through the separator. Suspended solids concentration in the raw gas cleaning water could be reduced by more than 99%. Chemical flocculant additions were not necessary. Experiments were also performed on the high-gradient magnetic separation for removing iron fines from cold rolling mill lubricant emulsions. Although the technique was found to be effective, further experiments are needed to evaluate the effects of the storage and shipment conditions of the emulsion on the magnetic separation efficiency. Larger scale testing of high-gradient magnetic separation for steel mill and process waste water is planned. (Kramer-FIRL)
W76-08710

INDUSTRIAL WASTE TREATMENT SYSTEM REDUCES POLLUTION,
Sherwood Medical Industries, Inc., Waterbury, Conn.
J. Klancko, R. B. Jones, and M. Michalak.
Industrial Wastes, Vol. 22, No. 1, p 27-29, January/February, 1976. 1 fig, 3 tab.

Descriptors: *Waste water treatment, *Metals, *Plastics, *Industrial wastes, Liquid wastes, Treatment facilities, Organic compounds, Filtration, Chemical precipitation, Water treatment, Waste treatment, Connecticut.

A system has been developed to treat various types of process wastes from the Sherwood Medical Industries Plant in Waterbury, Connecticut. Manufacturing operations such as burnishing, grinding, metal finishing, and non-contact cooling, produce waste streams containing large amounts of nitric acid, copper, abrasive grit, and metal fines. The basic treatment system involves conventional equalization, neutralization by means of lime slurry, clarification, and final filtration. In order to conserve water, uncontaminated non-contact cooling water has been routed to serve grinding operation. Grinding and finishing wastes are combined for treatment. Burnishing waste water, containing biodegradable organics, is routed to the sanitary sewerage system. Solids disposal and air pollution control are integral parts of the waste water treatment system. In the disposal of solids, clarifier underflow is pumped to a vacuum filter; cake is discharged to a conveyor and transferred to a scrap hopper. Grinding waste solids are associated with the filter cake and removed concurrently. The high copper content of the filter cake assures profitable sale. The total system for water, air, and solids removal results in a reduction in pollution and in the saving and reclamation of previously unrecoverable materials. (Kramer-FIRL)
W76-08711

MUNICIPAL INDUSTRIAL WASTE PROGRAM NETS $8.9 MILLION IN TWO YEARS.
Water and Sewage Works, Vol. 123, No. 4, p 84-88, April, 1976. 4 fig, 5 tab, 1 ref.

Descriptors: *Waste water treatment, *Sewerage, *Industrial wastes, *Municipal wastes, *Treatment facilities, *Costs, Legislation, California, Water quality control.
Identifiers: Municipal-industrial wastes, Sewer charges, *Combined treatment.

The 27 Sanitation Districts of Los Angeles County, California provide combined municipal and industrial sewerage service. Since 1972 when a waste ordinance was passed, industrial companies must reimburse their districts for waste water treatment costs. A quantity-quality surcharge structure was established, based on the charge parameters of total waste water flow, chemical oxygen demand, suspended solids, and peak flow. Peak flow charges reimburse the district for short term industrial use of the sewerage system and encourage the industries to discharge waste water during daily low flow periods. Monitoring for quality and measurement for quantity of waste water is required; the various flumes and weirs used are described. Engineering specialists from each of the six major contributing industries--petroleum production and refining, food processing, fibers, metal plating and toxic wastes, chemical processing, and primary metals--provide expertise in basic industrial areas, permitting close cooperation between the Districts and the major industrial dischargers. (Kramer-FIRL)
W76-08712

INDUSTRY TAKES THE LEAD IN CLEANING UP THE RHINE.
Surveyor, Vol. 147, No. 4367, p 24, 27, February 20, 1976.

Descriptors: Rivers, Toxicity, Waste disposal, *Waste water treatment, *Industrial wastes, Chemical industry, *Chemical wastes, Municipal wastes, *Treatment facilities, Sewerage.
Identifiers: Municipal-industrial wastes, *Rhine River(West Germany), *Combined treatment.

A new effluent treatment plant has been built by BASF at Ludwigshafen, West Germany, to treat both the waste water from the large chemical manufacturing facility and from the cities of Ludwigshafen and Frankenthal. The site has been occupied for over 100 years, and the old sewerage system had to be replaced with a dual system. Sewage from Ludwigshafen city and the BASF plant is collected by an interceptor sewer and treated with a lime solution. Sewage from Frankenthal also enters the system after coarse solids have been removed by screening; the sewerage is then filtered through a fine rack and is passed to four primary settlement tanks for the short retention time of 10 to 12 minutes. Activated sludge aeration then proceeds for 12 hours, followed by sludge thickening, dewatering, and incineration in fluidized bed furnaces. Ash is dumped to an island area, where the site will eventually be landscaped. The combined treatment plant has reduced BOD by 95% and COD and TOC by 80%. Discharge to the Rhine river is not yet of potable water quality, but industrial effluent which contains heavy metals is pre-treated and research into further purification is being conducted. (Kramer-FIRL)
W76-08713

AUSTRIAN EXPERIENCES CONCERNING DAMAGES OF COMMUNAL PURIFICATION FACILITIES BY INDUSTRIAL EFFLUENTS (OSTERREICHISCHE ERFAHRUNGEN BETREFFEND SCHADEN AN KOMMUNALEN KLARANLAGEN DURCH INDUSTRIEABWASSER).
W. Biffl.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 137-153, 1976. 9 fig, 15 tab, 4 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Industrial wastes, Municipal wastes, Water pollution control, Biological treatment, Dyes, Copper, Pulp wastes.
Identifiers: Municipal-industrial wastes, *Combined treatment, Austria.

Examples are presented of municipal waste water treatment plants in Austria that were overloaded by industrial effluents causing a reduction in purification efficiency or disturbances in plant operation. Such disturbances were due mainly to effluents from canning plants, tanneries, breweries, and wood processing plants, even though the nutrient ratios were usually within normal limits. It was usually possible to resume normal operation at high efficiency after adequate pre-treatment of the industrial effluents. Occasionally a flocculating agent, such as iron sulfate, was added in the aeration basin. In one case, high copper contents in an industrial waste water caused corrosion of the pipings. In another case, the high kaolin load of paper mill effluents rendered the sludge digester inoperable. Biological treatment plants also proved to be inefficient in the degradation of dyes and related substances. (Takacs-FIRL)
W76-08714

OXYGEN, AND OTHER INNOVATIONS, HELP LICK TOUGH WASTE PROBLEM,
Manganaro (Charles A.), New York.
M. Safhay.
Water and Wastes Engineering, Vol. 13, No. 3, p 30-31, 50, March, 1976.

Descriptors: *Industrial wastes, *Sewage treatment, *Oxygen, Biochemical oxygen demand, Activated sludge, Suspended solids, Municipal wastes, Odor, *Treatment facilities, New Jersey, Oxidation, *Aeration.
Identifiers: Municipal-industrial wastes, *Combined treatment.

The sewage treatment plant of the Passaic Valley Sewerage Commission at Newark, New Jersey, also treats wastes from 3000 area industries. In order to meet EPA standards for BOD and suspended solids, a system was designed for an oxygen utilizing activated sludge treatment which removes 93% BOD and suspended solids from an average flow of 300 mgd and combined peak flows of up to 720 mgd. To accomplish this, the facility produces 1000 tons of oxygen a day for its twelve 30-ft deep aeration tanks; has an extremely large Archimedes screw pump, 12.5 ft in diameter and 70 ft in length; is capable of applying 120 tons chlorine per day; uses a unique air injection conveyor system controlled by computers to transport and measure the screenings and grit from the plant; and utilizes 3000 hp outfall pumps to handle combined flows of up to one billion gpd. A 25-mile system collects and carries intercepted sewage to the plant. Treated effluent is carried through a six-mile outfall system and discharged below mean tidal level in New York harbor. New screening and grit chamber units have been designed and automated, as well as grease skimming devices. Odor removal facilities have also been added. Additional facilities are under construction and the entire plant will be in full operation by 1982. When completed, the plant will consist of 12 primary clarifier/oxygenation tank/final clarifier/sludge treatment tank units, each to handle average flows of 25 mgd. (Kramer-FIRL)
W76-08715

TREATMENT OF DYE WASTES WITH GRANULAR ACTIVATED CARBON,
ICI United States, Inc. Wilmington, Del.
P. B. DeJohn, and R. A. Hutchins.
Textile Chemist and Colorist, Vol. 8, No. 4, p 34-38, April, 1976. 8 fig, 7 tab, 16 ref.

Descriptors: *Textiles, *Color, *Activated carbon, *Industrial wastes, *Dyes, Adsorption, *Waste water treatment, Recycling, Waste treatment.

Dye wastes from the textile industry can be successfully treated using granular activated carbons. Information is presented on physical properties of lignite and bituminous coal carbons and the relationships between dye molecular weight and carbon adsorption in order to aid in the selection of a carbon system. The major design parameter for adsorption is the contact time between the waste water and the carbon necessary for purification. Size of the adsorber or carbon bed is based on this contact time. Design parameters for regeneration are carbon usage or regeneration rate required to maintain acceptable effluent from the plant and residence time in the furnace required to restore adsorptive properties. High molecular weight dyes are adsorbed in the transitional pores of an activated carbon while low molecular weight dyes are adsorbed in the micropores. The effect of thermal regeneration may be to drastically reduce the surface area in the micropores of an activated carbon. Lignite carbon properties are not changed as much as bituminous coal carbon properties as a result of thermal regeneration. These factors should be considered in order to avoid undersizing a carbon system. (Kramer-FIRL)
W76-08716

A MODIFIED RAW-WOOL SCOURING SYSTEM FOR EASIER EFFLUENT TREATMENT,
Commonwealth Scientific and Industrial Research Organization, Belmont (Australia). Div. of Textile Industry.
G. F. Wood, and C. A. Anderson.
Textile Institute and Industry, Vol. 14, No. 3, p 87-89, March, 1976. 2 fig, 3 tab, 7 ref.

Descriptors: *Textiles, *Industrial wastes, *Waste water treatment, Waste disposal, Recycling, Centrifugation, Detergents, Scour.
Identifiers: *Scouring(Raw wool).

A modified raw wool scouring system was evaluated. In this process, a scouring machine with a very high concentration of contaminants in the first bowl is operated, thus reducing the water consumption to a low figure. Discharge would therefore be a small volume of liquor carrying a high pollution load, and disposal of the concentrated waste would be easier than with conventional scouring processes. Results of experimental scouring runs showed that the low water consumption process was quite feasible, but would require special equipment. The system would discharge a liquor with a solids concentration of 20 to 30%; this could be incinerated economically without further treatment. The process would cost only half as much as other processes to achieve total effluent disposal. Additionally, higher grease recoveries could be achieved due to the destabilizing effect of the high detergent concentrations. (Kramer-FIRL)
W76-08717

CLEANING OF INDUSTRIAL EFFLUENT,
A. V. Fokin, S. Shifrin, and A. B. Zlotnikov.
Soviet Patent SU 435-196. Issued July 28, 1975. Soviet Inventions Illustrated, Vol. X, No. 2, p D1, February, 1976. 1 fig.

Descriptors: *Waste water treatment, *Chemical wastes, *Textiles, *Color, *Patents, Industrial wastes, Dyes, Oxidation, Equipment, *Cleaning.

A method has been patented for the treatment and decolorization of textile effluent. An effluent homogenizer, an oxidizer, a reactor, a neutralizer, and a settling tank are used. To increase the decoloring effect, a rectangular sectional reactor tank with cleaning sections containing iron-chip blocks is employed. The arrangement comprises an aerating installation, a foam remover, a foam condensation chamber, and a spent effluent chamber. Ninety to 95% of the textile dye is contained in only 20% of the total effluent. This portion is passed to the homogenizer non-uniformly over time at different concentrations of impurities and pH. Following homogenization, the material is cooled in heat exchangers from 80 to 90 C to 3 to 40 C. Cooled effluent enters the reactor after treatment; the pH is adjusted to below 3; and the effluent flows into various cleaning sections in turn. Contact with chips in the reactor deoxidizes organic dyes, giving amino compounds which mineralize in alkaline medium. Water from the reactor enters the neutralizer, where pH is adjusted to between 8.5 and 9. It then enters a gravity settler for final breakdown of the dye structure. Total decolorization efficiency is 98%; synthetic surfactant removal is 70 to 75%; reduction in organic material content is 70%; and reduction in suspended solids concentration is 60%. (Kramer-FIRL)
W76-08719

CANTON'S FUTURISTIC WASTE TREATMENT SYSTEM,
S. M. Suchecki.
Textile Industries, Vol. 140, No. 3, p 43-46, 49, March, 1976. 1 fig.

Descriptors: *Textiles, *Industrial wastes, *Waste water treatment, *Dyes, Color, Dissolved oxygen, Biochemical oxygen demand, Recycling, Water reuse, Alabama, Treatment facilities.
Identifiers: Caustic recovery, Indigo dyes.

Siluria Textile Mills, a manufacturer of indigo-dyed denim, has upgraded its waste water treatment facilities to meet Alabama water quality standards, using an interim system. In addition, a future system has been built and is operating on a pilot plant scale. Called WWTS/100, the system uses a special design for an electrodialysis unit to reduce pH and extract caustic and an electrolysis cell and flotation unit to remove indigo dye. The system will recycle not only the expensive indigo dye but also the hot process water and caustic. When in full operation, it will have a daily capacity of 100,000 million gallons. Both the interim treatment system and the WWTS/100 system screen dye waste to remove lint and grit. In the interim method, alum is added to neutralize caustic soda, indigo dyestuff is flocculated through 20 electrolysis units in the presence of alum, and water used is filtered, stored, and recycled, with only 50% of the water being reused in the rinsing section of the dye range. With WWTS/100, waste is passed through an electrodialysis unit to extract caustic soda for recovery and recycling. The pH is reduced from 11.5 to 6.5 without the addition of alum. Electrolysis is then accomplished in a single cell with a small alum addition and the indigo dye flocculant undergoes flotation for recovery and dewatering before recycling. About 75% of the water is filtered, stored and reused. Both systems use Bio-Trac activated sludge treatment, aeration lagoons, and effluent measuring and sampling combinations. (Kramer-FIRL)
W76-08720

RE-USE AND DISPOSAL OF WASTE ACIDS,
Hoeschst A. G., Frankfurt am Main (West Germany).
G. Theilig, G. Muller, and K. Hodenbenner.
Israel Journal of Chemistry, Vol. 14, p 234-243, July, 1975.

Descriptors: *Waste disposal, *Recycling, *Industrial wastes, *Acids, Evaporation, Oxidation, *Chemical wastes, Waste treatment.

Identifiers: Hydrochloric acid, Sulfuric acid, *Thermal degradation.

Several processes for the recycling and disposal of waste acids in the chemical industry are presented. The two main waste acid by-products are hydrochloric acid and sulfuric acid. Hydrogen chloride can be converted to chlorine by oxidation or by electrolysis of muriatic acid. Hydrochloric acid is also useful in the synthesis of such chlorohydrocarbons as vinyl chloride, methyl chloride, and chloroprene. While these methods to recycle waste hydrogen chloride start from a relatively pure chemical, the situation regarding sulfuric acid wastes are more varied. Sulfuric acid may be used as a solvent, condensating agent, or a water separating agent. It accordingly reappears as a by-product, diluted with water and contaminated by organic and inorganic substances. Major sources of waste sulfuric acid are the manufacture of titanium dioxide, pickling of steel, concentration of nitric acid, oil refining, and manufacture of organic intermediates. The disposal method for waste sulfuric acid depends upon water content of the acid. Such methods include dumping either directly or after neutralization, concentration and recycling, and production of sulfur dioxide by thermal decomposition. The latter method is often used for the disposal of oil refinery sludges, and is accomplished by either spraying the waste into a hot combustion chamber or by adding the waste to circulating granular coke. In addition to hydrochloric acid and sulfuric acid, several other waste acids are important to the chemical manufacturing industry. These include organic acids or their anhydrides which appear as volatile substances in exhaust gases to be removed by scrubbers, hydrogen bromide which is treated with a method similar to that of hydrogen chloride oxidation, and phosphoric acid which must be neutralized prior to disposal. (Kramer-FIRL)
W76-08721

METHANE FERMENTATION OF RUBBER (HEVEA BRASILIENSIS) LATEX EFFLUENT,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
K. Rajagopalan.
Canadian Journal of Microbiology, Vol. 22, No. 3, p 342-346, March, 1976. 1 fig, 1 tab, 20 ref.

Descriptors: *Methane, *Rubber, *Industrial wastes, *Anaerobic digestion, Effluents, Chemical wastes, *Fermentation.
Identifiers: *Rubber latex effluent.

Rubber factory effluent, produced from natural product processing in Malaysia, has a very high BOD and thus its treatment and disposal have caused serious pollution problems. Studies were made of the technique of methane fermentation of the effluent, to produce solids which can be recovered by sedimentation, facilitating the possible processing of the solids as a protein source and the individual treatment of the supernatant liquid phase. Twenty-one bacterial species were tested for their ability to ferment rubber latex effluent. Of these, four species capable of methane fermentation were isolated and identified as Methanococcus, a strain of M. vannielli, a Methanobacterium, and a strain of M. omelianskii. Results suggest that reduction of carbon dioxide and fermentation of acids formed during metabolism of the latex are possible pathways of methane production. (Kramer-FIRL)
W76-08722

USE OF SURFACE-ACTIVE CHEMICALS IN PUMP-ASHORE SCHEMES AND SUCTION DREDGERS,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 8C.
W76-08747

5E. Ultimate Disposal Of Wastes

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, GENERAL REPORT, VOLUME I,
Wahler (W. A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-08143

PROCESS FOR THE ENVIRONMENTALLY FAVORABLE DESTRUCTION OF SOLID AND/OR LIQUID CYANIDE WASTE,
Deutsche Gold- und Silber-Scheideanstalt A. G., Frankfurt-am-Main (West Germany). (Assignee).
For primary bibliographic entry see Field 5D.
W76-08208

OXYGEN RELATIONSHIPS IN A SOIL TREATED WITH SEWAGE EFFLUENT,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W76-08231

TRIVALENT CHROMIUM IN TANNERY EFFLUENTS,
Instituut TNO Leder en Schoenen, Waalwijk (Netherlands).
For primary bibliographic entry see Field 5D.
W76-08295

GUIDELINES FOR MATERIAL PLACEMENT IN MARSH CREATION,
Center for Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-08325

EFFECTS OF GRAZING ON INFILTRATION RATES IN WASTE WATER SPRAY FIELDS,
West Virginia Univ., Morgantown. Div. of Plant Sciences.
G. A. Pearson, G. A. Jung, R. E. Fowler, and D. M. Mitchell.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p. 954-957, 1975. 1 fig., 2 tab., 26 ref.

Descriptors: *Grazing, *Infiltration, *Waste water disposal, *Spraying, *Pastures, Food processing industry, Waste water treatment, Soils, Harvesting, Maintenance costs, Soil compaction, Forage palatibility.
Identifiers: *Grassed sprayfields.

To eliminate periodic mowing costs of effluent spray fields used by food processors, the effects of pasture on soil infiltration rates were measured. A waste water treatment field was grazed for 150 days from June-November by six Hereford steers for two successive years. The soil was Sassafras sandy loam and the grass 'Kentucky 31' tall fescue and orchardgrass. The infiltration rate at saturation was measured frequently during the grazing period. Trampling progressively reduced the infiltration rate from 2-2.5 cm/hr to about 0.3 cm/hr. These results indicate that when the soil is saturated, applications of water (waste water and/or rainfall) in excess of 0.3 cm/hr will result in runoff. Infiltration also remained low the following year. Lower stocking rates or different grazing management procedures may have a lesser effect on infiltration rates. An alternative would be to use the nutritive value of the grass by mechanically harvesting it as green-chop for cattle feed as it has been demonstrated that cattle prefer grass cut from a canning effluent spray field to that of the same species cut from other areas. (Buchanan-Davidson--Wisconsin)
W76-08352

METHOD AND APPARATUS FOR DRYING MOISTURE-CONTAINING SOLIDS, PARTICULARLY DOMESTIC REFUSE AND SLUDGE CAKES,
For primary bibliographic entry see Field 5D.
W76-08404

PROCESS OF PREPARING SEWAGE SLUDGE FOR DEWATERING,
Envirotech Corporation, Menlo Park, CA (Assignee).
For primary bibliographic entry see Field 5D.
W76-08409

LAND TREATMENT OF FOOD PROCESSING WASTEWATERS,
Campbell Soup Co., Camden, N. J. Environmental Engineering Dept.
L. C. Gilde.
Journal of the Irrigation and Drainage Division, Proceedings of ASCE, Vol. 99, No. IR3, p 339-352, September, 1973. 9 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Waste water disposal, Irrigation, Food processing industry, Infiltration, *Water reuse, Impervious soils.
Identifiers: Overland irrigation, Spray irrigation.

Spray irrigation for waste water disposal is widely used throughout the food processing industry. The use of this technique is usually limited to soil areas with high filtration capacity and thus the purified water is usually lost to the original user. The Campbell Soup Company system at Paris, Texas, employs the overland flow technique whereby water is applied to impervious soil and the purified effluent is collected at the foot of a vegetative slope. Consideration can be given to the collection and reuse of water from this type of system. At the Sumter, South Carolina, facility, a 5- to 7-foot layer of sandy soil with a high infiltration rate is underlin by a relatively dense substrata. The water after pretreatment is sprayed through a sprinkler system, falls on land which has been planted with special grasses, and infiltrates through the ground. It is picked up by underground perforated pipes and conducted to a final polishing pond and savanna. (Sandoski-FIRL)
W76-08468

TREATMENT OF PHOTOGRAPHIC FERROCYANIDE-TYPE BLEACH SOLUTIONS FOR REUSE AND DISPOSAL,
Computerized Pollution Abatement Corp., Leicester, N. Y.
For primary bibliographic entry see Field 5D.
W76-08472

NEW INCINERATION METHOD SOLVES GREASE PROBLEM IN RICHMOND, PA.,
Philadelphia Water Dept., Pa. Northeast Water Pollution Control Plant.
M. S. Cameron.
Water and Sewage Works, Vol. 120, No. 9, p 116-119, September, 1973. 3 fig.

Descriptors: *Waste disposal, *Chemical wastes, *Industrial wastes, *Waste water treatment, *Incineration, Oxygen, Oil wastes, Pennsylvania.
Identifiers: *Watergrate incinerator, Grease.

A method of waste disposal of grease from chemical, wool scouring and drying plants, and slaughterhouses has been developed in Philadelphia, Pennsylvania. The solution was to stop burning the grease in an open pit that contaminates the air, and to use a new furnace that can consume an estimated 1.6 million gallons per year of grease, scum, rags, and other floatable. Grease and other skimmings are piped into the base of the incinerator, which is an open-topped, water-tight compartment. Here the grease floats to the surface and comes in contact with an auxiliary gas burner

flame. The grease is exposed simultaneously to air blown at it by a fan. The combination of heat and oxygen causes ignition. Because high temperatures are generated, most surface material is reduced to CO2 and water. One unusual aspect of the incinerator is that the water functions as the grate. The Watergrate consists of five sections: a tank or water hearth, and ignition chamber, a lower combustion, an upper combustion chamber and a stack. The incineration process produces carbon dioxide and water, with almost no residual ash. Using the Watergrate, an operator manually skims the concentration tank and packs the grease/sludge mixture into a screw conveyor. Instead of ejecting the skimmings into the lagoons, they go to the furnace where heat causes the grease to melt, releasing some of the sludge to settle out. While sludge still adheres to the grease, the high temperatures generated cause it to simply burn up along with the floatables. (Sandoski-FIRL)
W76-08485

DEWATERING VEGETABLE WASTE.
Water and Waste Treatment, Vol. 16, No. 8, p 31, August, 1973.

Descriptors: *Food processing industry, *Waste disposal, *Dewatering, *Filters, Flocculation, *Industrial wastes, Filtration.
Identifiers: Vegetable waste, Polypropylene.

Pierson and Company, Limited, of Manchester, England, have developed a new application of an industrial filter, designed for the dewatering of vegetable waste. This horizontal belt filter delivers dry cake continuously, filters heavy fast settling slurries and fragile flocculated material, has continuous belt washing, and carries out cocurrent or counter-current cake wash. It is constructed of standard polypropylene, is flame proof, and has lower capital and maintenance costs than any other horizontal belt filter. (Sandoski-FIRL)
W76-08487

FIBER RECOVERY INCREASES WATER REUSE, REDUCES TREATMENT COST,
Dorr-Oliver, Inc., Stamford, Conn.
For primary bibliographic entry see Field 5D.
W76-08489

SLURRY-BURNING PROCESS.
For primary bibliographic entry see Field 5D.
W76-08498

ENVIRONMENTAL AND PUBLIC HEALTH CONSEQUENCES OF THE CONTROLLED DISPOSAL OF TRANSURANIC ELEMENTS TO THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5C.
W76-08604

REFUSE INTO POWER,
Louisville Univ., Ky. Dept. of civil Engineering.
For primary bibliographic entry see Field 5D.
W76-08693

RECYCLING--EXAMPLES FOR ITS POSSIBILITIES AND LIMITS (RECYCLING--BEISPIELE FUER MOEGLICHKEITEN UND GRENZEN),
For primary bibliographic entry see Field 5D.
W76-08701

CHEMICAL CLARIFICATION OF WASTE WATER.
For primary bibliographic entry see Field 5D.
W76-08702

THE EFFECTIVE MANAGEMENT OF WASTE.
For primary bibliographic entry see Field 5D.
W76-08704

THE ELECTROLYTIC PROCESSING OF CYANIDE WASTES,
For primary bibliographic entry see Field 5D.
W76-08706

INDUSTRIAL WASTE TREATMENT SYSTEM REDUCES POLLUTION,
Sherwood Medical Industries, Inc., Waterbury, Conn.
For primary bibliographic entry see Field 5D.
W76-08711

MUNICIPAL INDUSTRIAL WASTE PROGRAM NETS $8.9 MILLION IN TWO YEARS.
For primary bibliographic entry see Field 5D.
W76-08712

INDUSTRY TAKES THE LEAD IN CLEANING UP THE RHINE.
For primary bibliographic entry see Field 5D.
W76-08713

A MODIFIED RAW-WOOL SCOURING SYSTEM FOR EASIER EFFLUENT TREATMENT,
Commonwealth Scientific and Industrial Research Organization, Belmont (Australia). Div. of Textile Industry.
For primary bibliographic entry see Field 5D.
W76-08717

RE-USE AND DISPOSAL OF WASTE ACIDS,
Hoeschst A. G., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5D.
W76-08721

WATER QUALITY EFFECTS OF A DREDGING DISPOSAL AREA,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 5C.
W76-08749

5F. Water Treatment and Quality Alteration

WATER QUALITY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08155

ZERO ENERGY INPUT FLOCCULATOR,
W. L. Harris.
U.S. Patent No. 3,941,695, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 339, March 2, 1976.

Descriptors: *Patents, *Water treatment, Water quality control, *Water purification, Potable water, Mixing, Flocculation, Flow, Settling basins, Coagulation, *Flocculation.
Identifiers: *Flocculators.

The invention provides a flocculator which enables the formation of relatively large coagulant flocs while the need for any exterior power input to drive the flocculator is eliminated. A flocculator which is defined by a hub that is rotatable about an axis extending transversely to the water flow is placed in a sedimentation basin. A number of equally spaced trough-shaped paddles is mounted to the hub for rotation. The paddles are completely submerged and defined by relatively thin, undulated sheet members such as semi-circular sections of corrugated culvert pipe to enhance the strength and rigidity of the paddles and maximize the paddle surface. The surface maximization increases the ultimate floc size apparently because of the increase of the contacts between coagulant particles suspended in the raw water. The flocculator wheel rotates slowly with the water flow and thus causes only gentle water agitation which aids the formation of flocs without the danger of tearing apart already formed flocs. The trough-shaped configuration of the paddles and their transverse orientation to the water flow causes a rotation of the flocculator wheel by virtue of the water flow past it. (Sinha-OEIS)
W76-08200

STERILIZATION OF HOLDING TANKS AND TOILET BOWLS BY QUATERNARY COMPOUNDS,
Baylor Coll. of Medicine, Houston, Tex. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08201

MODULAR WATER FILTER,
Eaton Corp., Cleveland, Ohio. (Assignee).
R. N. Rogers, and M. O. Saar.
U.S. Patent No. 3,945,923, 6 p, 12 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1907, March 23, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Potable water, Water quality control, *Filtration, *Filters, Odor, Taste, Turbidity, Carbon filter.
Identifiers: Modular filters.

A modular filter assembly for cleaning and polishing potable waters includes a fabric turbidity removal module and an adsorptive taste and odor removal module. The modules are connected in series so as to have turbidity removal prior to taste and odor removal to extend the operating life of the taste and odor removal module. The turbidity removal module includes a porous, fabric material assembly which is of a rolled or wrapped construction which provides a large filtration area to prevent its clogging prior to the utilization of the adsorptive capabilities of the taste and odor removal module. The turbidity removal module includes a flow grid assembly having inner and outer flow grid to maximize the distribution of the fluid being filtered over the filtration area of the module and to assure lateral flow of the filtered fluid through the module. The modular construction enables the turbidity removal module to be utilized separately and renders the module self-cleaning when operated under certain flow conditions. The taste and odor removal module is provided with flow dispersion means which serves to reduce the flow velocity of the filtering fluid through the module to prevent channeling and maximize the adsorptive capacity of the adsorptive material contained in the module. (Sinha - OEIS)
W76-08210

THE WATER SUPPLY SYSTEM OF A LARGE URBAN AGGLOMERATION IN SWITZERLAND (DIE WASSERVERSOWGUNG EINER SCHWEIZERISCHEN GROSS-AGGLOMERATION),
M. Schalekamp.
Wasser- und Energiewirtschaft, Vol. 65, No. 6, p 211-225, June, 1973. 32 fig.

Descriptors: *Water supply, *Potable water, Groundwater resources, Spring waters, Surface waters, Construction, Pipelines, Water delivery, Water demand, Storage requirements.
Identifiers: Zurich(Switz), Lengg Lake.

The current and future water supply system of Zurich, Switzerland, and of its adjacent communities

has been determined. The increasing water consumption by industries and the population has led to a steadily decreasing percentage of drinking water obtainable from spring water and groundwater resources. Subsequently, the importance of surface water bodies as drinking water sources has been increased. Adequate water tariffs, closed water cycles in industrial processes, and the exclusive use of reflux coolers are among the basic methods of reducing water consumption. To meet future water needs, the water supply system will be enlarged in the next twenty years by the extension of the Lengg Lake waterworks, the construction of the necessary pipelines, the enlargement of the Zurich water supply system including the construction of groundwater waterworks at Hardhof and of emergency waterworks elsewhere, and by the construction of a new lake waterworks complete with pipelines and storage basins at Moos. (Nave-FIRL)
W76-08233

WATER TREATMENT UNTOUCHED BY HUMAN HANDS - ALMOST,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
E. H. Pitman.
The American City, Vol. 88, No. 9, p 92-94, September, 1973. 4 fig.

Descriptors: *Treatment facilities, *Water treatment, *Automation, Water distribution(Applied), Telemetry, Water softening, Filtration, Filters, Coals, Turbidity, Effluent, Reservoir storage, Pumps, Control systems, Monitoring, Computers, Florida.
Identifiers: Gainesville(Fla), Clarifiers, Lime-soda softening.

The new Gainesville, Florida, water plant will go on-line next year, and will be one of the most automated existing 40 mgd lime-soda softening operations. Telemetry will be used to monitor all plant functions, and a computer will control the water treatment processes. The computer also will tie into the present telemetry of the city water distribution system. Treatment will consist of lime-soda softening with two, 85-foot diameter Eimco solids contact reactor clarifiers. Two submersible-combustion Ozark-Mahoning recarbonators, using natural gas, will stabilize the clarified water. The plant will have four filters, each processing 10 mgd at a 5 gpm/sq ft filtration rate. The Turbatrol mixed media filters will use granular anthracite and sand over a Leopold filter underdrain bottom. Turbidity monitoring at the media interface and at the effluent outlet will be provided as will loss of head indicators for backwash control. Backwash will be started manually by the operator with automatic sequencing thereafter. Filtered water will be controlled in an 875,000-gallon capacity clear well for transfer to two 5-million-gallon capacity ground storage reservoirs. A 500,000-gallon capacity wash water tank will provide a nearly constant head during the backwash cycle using the plant's Peerless pumps. (Sandoski-FIRL)
W76-08266

WATER QUALITY CRITERIA FOR GREAT LAKES WATERS TO BE USED AS MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5D.
W76-08363

DEMAND BACTERICIDE FOR DISINFECTING WATER AND PROCESS OF PREPARATION,
Kansas State Univ. Research Foundation, Manhattan. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08391

WATER FILTER ASSEMBLY,
For primary bibliographic entry see Field 8C.
W76-08392

DRINKING WATER PURIFICATION IN INDUSTRIALLY MANUFACTURED COMPACT INSTALLATIONS OF THE TYPE 'STRUYA', (IN ENGLISH),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
V. M. Korabel'nikov, L. A. Sergunina, A. I. Itskova, S. I. Plitman, and D. I. Stolbov.
Gig Sanit. 3, p 33-38, 1975.

Descriptors: *Water treatment, *Potable water.
Identifiers: *Struya treatment installations, USSR.

Struya industrial installations are effective for small and rural local water supply systems. The simple, compact Struya installation decontaminates and disinfects drinking water.--Copyright 1976, Biological Abstracts, Inc.
W76-08579

5G. Water Quality Control

AN OPTIMIZATION MODEL FOR REGIONAL WATER QUALITY MANAGEMENT,
Lehigh Univ. Bethlehem, Pa. Dept. of Economics.
J. R. McNamara.
Water Resources Research, Vol. 12, No. 2, p 125-134, April 1976. 3 fig, 2 tab, 26 ref.

Descriptors: *Water quality, *Management, *Pollution abatement, *Optimization, *Hudson River, Waste treatment, Marginal costs, Flow, Regulation, Biochemical oxygen demand, Constraints, Decision making, Mathematical models, Equations, Systems analysis, *New York.
Identifiers: Nonlinear programming, Geometric programming, Cost minimization.

The use of combinations of pollution abatement techniques will become imperative in coming years as waste loads increase and the application of secondary level treatment at each point of discharge becomes inadequate to maintain the desired levels of water quality. At high levels of waste treatment, costs rise nonlinearly with the fraction of waste removed. The marginal cost of each of a series of pollution abatement techniques at a given location is likely to be less than the marginal cost of a single technique operated very intensively. Herein, a nonlinear programming model for water quality management is developed, capable of assessing the contributions of a variety of pollution abatement techniques and compatible with an efficient solution procedure. Formulated as a geometric programming problem, the model is intended to be a preliminary selection device permitting the planner to compare alternative configurations and to sketch a roughly optimal solution. It is shown that this formulation permits the simultaneous consideration of waste treatment processes, bypass piping, flow regulation, and artificial aeration in determining a least-cost solution to a given water quality management problem. The model is applied to the upper Hudson River of New York. (Bell-Cornell)
W76-08104

LAND USE AND WATER QUALITY IN NEW YORK RIVERS,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08133

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, GENERAL REPORT, VOLUME I,
Wahler (W. A.) and Associates, Palo Alto, Calif.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 074, $7.75 in paper copy, $2.25 in microfiche. Bureau of Mines OFR 50(1)-75, December 1974. 202 p, 43 fig, 5 tab, 3 append. Bu Mines S0110520.

Descriptors: *Disposal, *Mine wastes, *Dam failure, Mills, Mining, Hydrology, Mining engineering, Geology, Waste disposal, Evaluation.
Identifiers: *Mill tailings, *Disposal practices, *Disposal systems and methods, Inundation, Seismicity, Stability analysis, Liquifaction, Phreatic surface.

The results of a study of mill tailings disposal practices and potential tailings dam stability problems were presented. The Bureau of Mines initiated this research effort as a first step in the development of technology and practices necessary to significantly improve refuse disposal safety. This volume, Volume I included a summary of conclusions and recommendations resulting from the overall research effort; discussions of disposal systems and methods, geology, seismicity, hydrology, and materials characteristics; evaluation of investigational techniques; discussions of usable interim generalized investigational, analytical and inspection procedures; discussion of general principles and presentation of a tailings technology manual outline; and discussion of needed future research and recommended programs. (Roberts - ISWS)
W76-08143

WHAT DOES A 'CLEAN' ENVIRONMENT COST,
Houston Univ., Tex.
R. G. Thompson, and R. J. Lievano.
Hydrocarbon Processing, Vol. 54, No. 10, p 73-77, 1975. 4 tab.

Descriptors: *Pollution abatement, *Standards, *Energy, *Costs, Prices, Fossil fuels, Demand, Supply, Water quality standards, Environment.
Identifiers: Price regulation.

Modeling results are cited to show how pollution abatement standards affect the demand and supply of fossil fuels and how the effects of price regulation relate to their production. 'Strict' industrial pollution abatement standards almost double the price of natural gas, primarily due to the incentive to substitute clean fuel for investment in abatement equipment. With price deregulation, 'lax' standards induce a sufficient level of oil and gas prices to stimulate a maximum supply response for fossil fuels. The model shows that 36% more gas is produced under deregulation than was produced under regulated prices, but only 3.7% more crude is produced in the lower 48 states in 1985 under deregulation. 'Lax' standards generate coal production by 94% at a 1985 market-clearing price of $14.04/ton; 'strict' standards would increase coal prices slightly. 'Strict' standards and higher energy prices reduce usage of natural gas, electricity, and gasoline in residential and transportation sectors. However, use of both oil and coal increases with 'strict' standards and higher energy prices because the relative rise in delivered price of oil is less than the increase in delivered prices of gas and electricity. 'Strict' standards increase water use by 288% and solid waste discharges 180-fold. (Auen-Wisconsin)
W76-08150

ENVIRONMENTAL QUALITY AND INFLATION: A REGIONAL PERSPECTIVE ON THE COST-PUSH IMPACT OF THE 1972 PURE WATER LEGISLATION,
Lyndon B. Johnson School of Public Affairs, Austin, Tex.
K. E. Haynes, and W. T. Kleeman.
Environment and Planning, Vol. 7, No. 5, p 567-574, 1975. 1 fig, 4 tab, 8 ref. NSF-RANN GI-34870X.

Descriptors: *Water pollution control, *Industries, *Waste water treatment, *Inflation(Economic), Legislation, Economic impact, Regional economics, Texas, Input-output analysis, Water quality standards.
Identifiers: Corpus Christi(Texas), PL 92-500, Effluent standards, Pure Water Act.

The inflationary effects of the 'Pure Water' Act (PL 92-500) requiring 'Best Available Treatment' of major industries' wastes by 1978 and zero waste discharges by 1983 were measured at the 13 county regional economy of Corpus Christi, Texas, by first assessing the consequences of unrestricted economic growth and no environmental controls and comparing growth rates under different environmental policy assumptions. The study was based on a preexisting input-output model and in addition to the usual application of such models for assessing impacts of exogenous influences on income and employment, the focus was on the relationship between pollution abatement and the effects of increasing prices on each sector and on the economy as a whole. The resulting new dollars values of total inputs were greater than those projected under unrestricted economic growth. For 1980, the only sector that had a total-output price increase of more than 1% was water and sanitary services, which went up by 9.93%. When all 71 industrial sectors were taken together the price increase averaged only 0.04%. Under the zero discharge policy prices again increased, but only modestly. Water and sanitary services showed a jump of 22.38% over the projected levels. However, for all 71 processing sectors together the increase averaged only 0.07%. (Auen-Wisconsin)
W76-08151

ECONOMIC CONCEPTS AND TECHNIQUES PERTAINING TO WATER SUPPLY, WATER ALLOCATION, AND WATER QUALITY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08152

WATER QUALITY.
Institute for Water Resources (Army), Fort Belvoir, Va.
In: 'Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality', IWR Paper 75-P5, December 1975. Part Three. 120 p, 1 fig, 62 tab. DACW31-76-M-0435.

Descriptors: *Planning, *Water quality, *Water treatment, *Estimated costs, Water types, Pollutants, Water utilization, Technology, Reservoirs, Wells, Groundwater recharge, Design data, Intakes, Pipelines, Construction costs, Operating costs, Maintenance costs, Water storage, Pumping plants, Desalination plants, Sewage treatment, Outlets, Water reuse, Waste water treatment, Storm water, Interception sewers, Waste water disposal, Cooling towers, Cost allocation, Capital costs, Evaluation, Damages.
Identifiers: Water quality indices.

In order to assist planners in giving fuller recognition of water quality characteristics, quantifying them, and integrating them more meaningfully in their water supply plans and project designs, this section reviews surface water resources and their contaminants, water quality indices and standards, water user tolerances, water quality models, technology and costs of raw and waste water treatment, water quality benefits, and optimization of water supply purification, allocation, and waste water renovation. Cost estimating data is presented together with methods of estimating costs. A number of economic techniques are discussed for taking into account and quantifying water quality parameters, utilizing available water quality enhancement technology, determining the value of water quality, assessing damages attributable to the use of inferior water quality, blending and allocating water of varying quality, and maintaining instream water quality levels. A broad range of water quality problems are reviewed and examples given for the application of optimization techniques in arriving at alternative solutions. A number of useful approaches and methods for dealing with water demand situations in which water quality is an irrelevant or important factor are also presented. Topics are grouped under 'Water quality concepts,' 'Water quality enhancement technology and cost,' 'Water quality benefits,' 'Water quality optimization,' and 'Waste water renovation for reuse.' (See also W76-08152) (Auen-Wisconsin)
W76-08155

CONTROL OF ACID MINE DRAINAGE.
Institute for Water Resources (Army), Fort Belvoir, Va.
In: 'Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality, IWR Paper 75-P5, December 1975. Part Three, Sec IX. 8 p. DACW31-76-M-0435.

Descriptors: *Costs, *Pollution abatement, *Strip mines, *Acid mine water, Mine drainage, Ohio, Decision making, Land reclamation.

The problem considered is whether a small strip mine in southeastern Ohio can afford to control water pollution and restore the disturbed land. Analysis was based on the nature of the market, the firm's cost schedule as affected by water quality criteria and the least-cost technology. The conclusion is that at least one level of acid mine water treatment was feasible, but only with steeply rising revenues dependent on inelastic demand. When the cost of acid water control is added to the cost of land reclamation the cheapest of the four control methods priced and the least-cost of the three land reclamation techniques combined would add 11 cents to the cost of processing a ton of coal. The most expensive combination would add 41 cents per ton. (See also W76-08152) (Auen-Wisconsin)
W76-08156

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, TEXTILE INDUSTRY.
Lockwood Greene Engineers, Inc., Spartanburg, S. C.
Available from the National Technical Information Service, Springfield, Va., 22161, ad PB-244 802, $13.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/06, August 1975, 481 p. WQ5AC021.

Descriptors: *Industrial wastes, *Textiles, *Estimated costs, Effluents, Industrial water, Pretreatment(Water), Water quality standards, Federal Water Pollution Control Act, Regulation, Water pollution control, Capital costs, Operation and maintenance, *Waste water treatment, *Pollution abatement, Pulp wastes.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Textile industry, *Water pollution control technology.

Water pollution abatement technologies are examined for 11 subcategories of the textile industry (SIC 22) capable of meeting four levels of effluent limitations, including those promulgated by the U. S. Environmental Protection Agency under the Federal Water Pollution Control Act Amendments of 1972, i.e., BPTCA or best practicable control technology currently available for 1977 and BATEA or best available technology economically achievable for 1983. Total estimated costs for the industry to meet the 1977 level, expressed in 1973 dollars, was $384-780 million in capital expenditures depending upon land availability and cost and $49-68 million annually in operation and maintenance. Total estimated costs for the industry to meet the 1983 level, also in 1973 dollars, was an additional $526-785 million in capital expenditures and an additional $50-81 million annually in O and M. Pretreatment requirements for the industry as presently promulgated were found to offer little encouragement for a firm to use municipal treatment systems. (NCWQ)
W76-08186

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, CANNED AND PRESERVED FRUITS AND VEGETABLES,
Environmental Associates, Corvallis, Oreg.
A. F. Mauldin, and M. R. Soderquist.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 801, $21.25 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/05, June 1975, 828 p, 6 append. WQ5AC010.

Descriptors: *Canneries, Federal Water Pollution Control Act, *Costs, Regulation, *Pollution abatement, Technology, *Food processing industry, Water quality standards, *Industrial wastes, *Waste water treatment, *Estimated costs, Water pollution control, Operating costs, Capital costs, Maintenance costs, Performance.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Fruits, Vegetables, *Water pollution control technology.

Water pollution abatement technologies are examined for approximately 20 subcategories of the fruits and vegetables industry (SIC 2032, 2033, 2034, 2035, and 2037) capable of meeting six levels of effluent limitations, two of them corresponding to levels promulgated by the U. S. Environmental Protection Agency under Federal Water Pollution Control Act Amendments of 1972, i.e. BPCTA or best practicable control technology currently available for 1977 and BATEA or best available technology economically achievable for 1983. A strategy incorporating both inplant modifications and end-of-pipe treatment systems was utilized involving a number of portions for each level. Costs were developed in 1973 dollars for capital, operation and maintenance and requirements considered for non-financial resources. Performance is stated in terms of resulting effluents. Approximately 1,000 treatment plant cost estimates are presented. (NCWQ)
W76-08187

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE ORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 544, $21.25 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/03, June 1975, (800) p. WQ4AC015.

Descriptors: *Chemical industry, Federal Water Pollution Control Act, Technology, *Industrial wastes, *Chemical wastes, Organic wastes, *Costs, Waste disposal, *Pollution abatement, Capital costs, Operating costs, *Water pollution control, Maintenance costs, Performance, Effluents, *Waste water treatment, Treatment facilities.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Miscellaneous chemicals industry, *Organic chemicals industry.

Technologies are examined which are currently available or anticipated for the organic chemicals industry (SIC 2865 and 2869) and the miscellaneous chemicals industry (SIC 2831, 2833, 2834, 2861, 2879, 2891, 2892 and 2899) to meet water pollution abatement requirements of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). Levels of pollution abatement which are reviewed include those promulgated by U. S. Environmental Protection Agency for 1977 (BPCTCA or best practicable control technology currently available) and for 1983 (BATEA or best available technology economically achievable). Capital, operating and maintenance costs are given in 1973 dollars. Performance is stated in terms of resulting effluents. (NCWQ)
W76-08188

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE INORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 800, $13.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/04, June 1975, 503 p. WQ4AC015.

Descriptors: *Chemical industry, Federal Water Pollution Control Act, Technology, *Industrial wastes, Chemical wastes, *Inorganic compounds, *Costs, Waste disposal, *Pollution abatement, Capital costs, Operating costs, *Water pollution control, Maintenance costs, Performance, Effluents, *Waste water treatment, Treatment facilities.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Inorganic chemicals industry.

Technologies are examined which are currently available or anticipated for the inorganic chemicals industry (SIC 2812, 2813, 2816 and 2819) to meet water pollution abatement requirements of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). Levels of pollution abatement which are reviewed include those promulgated by U. S. Environmental Protection Agency for 1977 (BPCTCA or best practicable control technology currently available) and for 1983 (BATEA or best available technology economically achievable). Capital, operating and maintenance costs are given in 1973 dollars. Performance is stated in terms of resulting effluents. (NCWQ)
W76-08189

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES PETROLEUM REFINING INDUSTRY, PART 1, CHAPTERS -V.
Engineering-Science, Inc., Austin, Tex.
Available from the National Technical Information Services, Springfield, Va., 22161, as PB-243 830, $16.25 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/02, Pt. I, June 1975, 303 p. WQ5AC004.

Descriptors: *Industrial wastes, Federal Water Pollution Control Act, Regulation, Industrial water, Organic compounds, Technology, *Pollution abatement, Water quality standards, *Water pollution control, Operating costs, Capital costs, *Costs, Maintenance costs, Oil wastes, Oil pollution, *Waste water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Petroleum refining industry, Water pollution abatement, Water pollution control technology.

Chapter headings are: Executive Summary; Inventory of Petroleum Refining Industry; Subcategorization Methodology; Levels of abatement Performance; and Technology Capabilities of Refinery Wastewater Abatement Systems. Technologies are examined which are available or anticipated for the petroleum refining industry (SIC 2911) to achieve water pollution abatement as required by the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). Six levels of pollution abatement are reviewed including EOD (elimination of the discharge of pollutants) and levels promulgated by the U. S. Environmental Protection Agency for 1977 (BPCTCA or best practicable control technology currently available) and for 1983 (BATEA or best available technology economically achievable). Capital, operating and maintenance costs are given in 1973 dollars along with requirements for non-financial resources. Performance is stated in terms of resulting effluents. (See also W76-08191) (NCWQ)
W76-08190

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, PETROLEUM REFINING INDUSTRY, PART 2, CHAPTERS VI - IX.
Engineering-Science, Inc., Austin, Tex.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-243 830, $16.25 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/02 - pt 2, June 1975, 364 p, 6 append. WQ5AC004

Descriptors: *Industrial wastes, Federal Water Pollution Control Act, Regulation, Industrial water, Organic compounds, Technology, *Pollution abatement, Water quality standards, *Water pollution control, Operating costs, Capital costs, *Costs, Maintenance costs, Oil wastes, Oil pollution, *Waste water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Petroleum refining industry, Water pollution abatement, Water pollution control technology.

Chapter headings are: costs, labor and material for water pollution abatement; industry-wide cost, labor and material requirements; new refineries and expansions; and effect of other variables on refinery waste treatment. Technologies are examined which are available or anticipated for the petroleum refining industry (SIC 2911) to achieve water pollution abatement as required by the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). Six levels of pollution abatement are reviewed including EOD (elimination of the discharge of pollutants) and levels promulgated by the U. S. Environmental Protection Agency for 1977 (BPCTCA or best practicable control technology currently available) and for 1983 (BATEA or best available technology economically achievable). Capital, operating and maintenance costs are given in 1973 dollars along with requirements for non-financial resources. Performance is stated in terms of resulting effluents. (See also W76-08190) (NCWQ)
W76-08191

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, PLANNING.
Wise (Harold F.) and Associates, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 907, $8.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/10, August 1975, 228 p, 6 append. WQ5AC030

Descriptors: Land development, Federal Water Pollution Control Act, Institutions, Land use, Permits, Treatment facilities, Regulation, *Planning, Water quality standards, Pollution abatement, River basin development, *Administration, Construction costs, Waste treatment, *Institutional constraints, Water pollution control, Administrative agencies.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Land use planning, *National Pollutant Discharge Elimination System, Water pollution abatement.

The planning sections of the Federal Water Pollution Control Act Amendments of 1972 (Secs. 106, 208, 209, and 303) are examined along with their administration by the U. S. Environmental Protection Agency and the states. Planning is not yet fulfilling its role of ordering and integrating the key parts of the law, the National Pollutant Discharge Elimination System and the municipal facilities construction program. An important reason is the constraint of time and the need for the Federal and state agencies to implement these programs quickly. The most significant planning provision of the law, Sec. 208, which calls for area planning, is as yet virtually untried, but difficulties of administration are foreseen. One is the jealousy of local governments of their authority over land use. (NCWQ)
W76-08192

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, THE PERMIT PROGRAM.
Energy and Environmental Analysis, Inc., Arlington, Va.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 805, $11.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/09, August 1975, 388 p, 12 fig, 65 tab, append. WQ5AC041

Descriptors: Effluents, Federal Water Pollution Control Act, *Permits, Regulation, Industrial wastes, Institutions, *Administrative agencies, Sewage treatment, Federal-State water rights conflicts, *Administration, Waste disposal, Water quality standards, Treatment facilities, Waste treatment, Water pollution control, Pollution abatement, Institutional constraints.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *National Pollutant Discharge Elimination System, Water pollution abatement.

The permit program (the National Pollutant Discharge Elimination System) established by Section 402 of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) is examined. Its administration is described as successful in achieving compliance by industry but a failure as applied to municipal dischargers; permits to municipalities so far issued, can be described as 'licenses to pollute.' Eighty percent of industrial dischargers surveyed indicated that they would install 'best practicable control technology' and additionally required technology by July 1, 1977, but industry will contest upcoming 1983 standards for best available treatment, toxic standards and pre-treatment standards. Federal-State relations in administering the program were strained and awkward at the beginning but are now improving. (NCWQ)
W76-08193

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, CONSTRUCTION GRANTS.
Touche, Ross and Co., Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 804, $10.50 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/08, August 1975, 342 p. WQ5AC046

Descriptors: *Construction costs, Pollution abatement, Institutions, Planning, Financing, *Treatment facilities, Waste water treatment, Surveys, Grants, Federal Water Pollution Control Act, Pollution abatement, Waste treatment, Operation and maintenance, Specifications, Water pollution control, Water quality standards.
Identifiers: *Construction Grants, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement.

The Construction Grants program established by the Federal Water Pollution Control Act of 1972 (PL 92-500) is examined. Five operational functions are identified and analyzed -- the needs survey/priority list, facility planning, (Step 1), plants and specifications (Step 2), construction (Step 3), and operation and maintenance. The management functions of program guidance, organization, capital funding and management systems are also reviewed. The existing procedures at the federal, state and local levels are overly complex and must be simplified through a comprehensive management system. The program will not achieve the water pollution control objectives of the law (relating to publicly owned treatment works) within the established time frames, although significant progress is being made toward the objectives. (NCWQ)

W76-08194

AN ANALYSIS OF U. S. ENVIRONMENTAL PROTECTION AGENCY'S NEEDS SURVEY,
American Public Works Association, Chicago, Ill.
R. H. Sullivan, and M. B. Cohn.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 803, $10.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/07, August 1975, 324 p, 100 tab, 2 append. WQ4AC014

Descriptors: Combined sewers, Federal Water Pollution Control Act, Surveys, Grants, *Treatment facilities, *Municipal wastes, Financing, Sewage treatment, *Estimated costs, *Construction costs, Sewers, Pollution abatement, *Waste water treatment, Sludge disposal, Storm sewers, Waste disposal, Water pollution, Water quality.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Water pollution control technology.

Representatives of states and major municipalities were asked how they based their construction cost estimates for publicly owned wastewater treatment works which they submitted for the U. S. Environmental Protection Agency's 1974 needs survey, as required by Section 516 of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500). Sources of overstated costs included high population estimates, lack of cost effectiveness analysis, and the assumption that sewer separation is the principal solution to combined sewer overflow problems. Possible reasons for understated costs were missing entries and omission of sludge disposal costs. Areas of uncertainty included incomplete sewer system evaluation, availability of stormwater control technology, and accuracy of assumptions concerning required effluent quality. Additional information was obtained on funding, unreported needs and construction progress. (NCWQ)
W76-08195

CLEANING OF CARGO COMPARTMENTS,
D. Gutnick, and E. Rosenberg.
U.S. Patent No. 3,941,692, 6 p, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 338, March 2, 1976.

Descriptors: *Patents, Water pollution, *Water pollution control, *Water quality control, *Oil pollution, Oil wastes, Storage tanks, Oily water, Cleaning, Microbial degradation, Biological treatment, Safety, Pollution abatement.
Identifiers: Ballast water.

The invention provides an economical and safe process of carrying out the cleaning of the cargo tank compartments and the use of water ballast, in one operation, and at the same time, of converting the waste petroleum oil in the cargo tank compartment into useful and valuable protein products. The residual oil in the cargo tanks, after they have been emptied, can be converted whooly or in part to non-oily products by means of microbial action, so that the subsequent cleaning of the cargo compartment can be carried out with a minimum effort and without the buildup of dangerous electrostatic charges. Sea water is added to the cargo compartment tank, after it has been emptied of its oil. The sea water is added primarily as a vehicle for the microbial fermentation process and no attempt is made at this point to wash the compartment. Nitrogen and phosphorus are added as well as small amounts of other carbohydrate sources such as glucose, starch and the like. The mixture of residual oil, nutrients and water is then used without sterilization. A suitable microbial inoculum is then added and the fermentation carried out under aerated conditions. (Sinha - OEIS)
W76-08198

COANDA EFFECT OIL-WATER SEPARATOR,
Office of the Secretary (Navy). Washington, D. C.
A. J. Paszyc, D. Pal, and J. B. Curry.
U.S. Patent No. 3,945,920, 3 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1906, March 23, 1976.

Descriptors: *Patents, *Water pollution treatment, *Water purification, *Water quality control, *Water treatment, *Separation techniques, Oil pollution, Oily water, Centrifugation, Bubbles.
Identifiers: Coanda effect.

An oil-water separating device utilizes the wall attachment effect for separating oil from an oil-water mixture in a continuous manner. The device is comprised of an oil-water mixture inlet nozzle delivering the mixture into a bounded region inside the separator to form a mixture jet which attaches to one wall creating a separation bubble in the bounded region. The bounded region is provided by a cavity formed by two or more plates joined together with an oil collecting chamber provided on top of the bounded region by an additional plate. The oil is captured in the bounded region by the separation bubble and flows into the oil collecting chamber through connecting holes. The oil in the collecting chamber is transferred by an oil outlet, either by siphoning or by means of a metering pump to an oil storage tank. The water, being heavier, tends to flow away from the separation bubble created by the centrifugal force field. The substantially oil-free water can be pumped back into the sea or can be pumped back to the input for recycling if desired. A multiple stage oil-water separator can be provided by forming a plurality of series-connected, bounded regions between the two plates. (Sinha - OEIS)
W76-08209

INNOVATIVE TECHNOLOGIES FOR WATER POLLUTION (ABATEMENT).
Water Purification Associates, Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 390, $13.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ-75/13, December 1975, 524 p, append. (In association with Process Research, Inc., Cambridge, Mass.). WQ5AC089.

Descriptors: *Pollution abatement, *Technology, Federal Water Pollution Control Act, Water pollution control, *Permits, *Land management, Costs, Industrial wastes, Membrane processes, Separation techniques, Sewage treatment, Waste disposal, Adsorption, *Waste water treatment, Sludge disposal, Combined sewers.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Elimination of discharge(Wastes).

The 1985 goal of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) calls for the elimination of discharge (EOD) of pollutants. Innovative technologies capable of achieving or approaching EOD are examined and include land treatment, membrane separation, adsorption, thermal separation, chemical oxidation, and suspended matter removal. Various options are examined for ultimate disposal of the pollutants removed from the wastewaters. The study indicates that innovative technologies can achieve or closely approach EOD for municipal and all major industrial sources. Costs generally fall in the range of $1 to $5 per 1000 gallons (1973 dollars) but higher costs may be experienced for some technologies in certain applications. Lower costs generally apply for land treatment systems where conveyance is not excessive. Land treatment alone does not achieve EOD but must be supplemented with other technologies to achieve salt removal. Research and development over the next decade should be directed to membrane separation, adsorption, land treatment and residuals disposal. (NCWQ)
W76-08220

THE WATER POLLUTION CONTROL ACT OF 1972 INSTITUTIONAL ASSESSMENT, ATTITUDES OF PARTICIPANTS.
Oregon Research Inst., Eugene.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-247 392, $10.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ-75/15, December 1975, 212 p, 6 append. WQ5AC067

Descriptors: *Attitudes, Social aspects, Public rights, *Permits, *Regulation, Federal Water Pollution Control Act, Social values, *Institutional constraints, *Social change, Social impact, Administrative agencies, Legal aspects, *Social participation.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Three groups of persons are surveyed who are 'participants' in the implementation of the Federal Water Pollution Control Act: Federal and State officials; industries, municipalities and consulting engineers; and environmentalists. Substantial support for the Act was found, ranging (as measured by the expression of favorable attitudes) from 94 percent of U.S. Environmental Protection Agency employees to 53 percent of industrialists. Major problems and areas of basic disagreement were found, among them were the chances of achieving the Act's goals by the dates called for; the wisdom of the goals themselves, particularly the 1985 goal of the elimination of the discharge of pollutants; and rigid v. flexible procedures of enforcement. (NCWQ)
W76-08221

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, URBAN RUNOFF.
Black, Crow and Eidsness, Ind., Atlanta, Ga.; and Jordan, Jones and Goulding, Inc. Atlanta, Ga.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-247 391, $10.75 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ-75/14, December 1975, 380 p, 29 fig, 110 tab, 129 ref. WQ5AC083.

Descriptors: *Cost analysis, Water quality control, Drainage, *Urban runoff, Rainfall, *Storm water, Cities, Runoff, Pollution abatement, Soil erosion, Mathematical models, *Storm sewers, Urban hydrology, Surface waters, Waste water treatment, Waste treatment, Water pollution control.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

This study shows that urban stormwater runoff contributes significantly to the annual pollutant loads of the Nation's waters in urban areas. Suspended solids and oxygen demand characteristics of urban runoff appear to be the most significant contributions to pollution when compared with other publicly owned sources. The composition of urban stormwater runoff was found to vary widely in pollutant constituents for many poorly defined reasons. The treatment technology best suited to the abatement of urban stormwater pollution remains to be developed. Abatement of urban stormwater pollution to a level equivalent to secondary treatment would represent a commitment of approximately 150 to 170 billion dollars. (NCWQ)
W76-08222

USE OF CRUSHED LIMESTONE TO NEUTRALIZE ACID WASTES,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
F. H. Pearson, and A. J. McDonnell.
Journal of the Environmental Engineering Division, Proceedings of the Society of Civil Engineers, Vol. 101, No. EE1, Proceedings paper No.

11131, p 139-158, February 1975. 11 fig, 35 equ, 10 ref. OWRT A-030-PA(5).

Descriptors: *Acids, Treatment, Environmental engineering, Wastes, *Limestones, Mathematical models, Optimization, Equations, *Kinetics, Design, Neutralization, Water quality, *Waste water treatment.
Identifiers: Reactors.

To provide for the rational design of limestone neutralization processes, the kinetics of the chemical reactions involved were evaluated by experiment, and an analysis was made of the chemical and physical boundary conditions that control the extent to which the reactions are completed. The rate limiting reactions are the attack of limestone by hydrogen ions, and the exsolution of carbon dioxide which is thereby generated; the latter reaction has an increasing effect on process efficiency above pH 5. Rate constants for the limiting reactions were evaluated each as a function of temperature, ionic strength, water turbulence, and for the first reaction bicarbonate ion concentration, which catalyzes the attack of limestone by hydrogen ions. A mathematical model of limestone neutralization processes was simplified to obtain a graphical procedure for the process design for neutralization. These graphs indicate the quantity of crushed limestone of given size that is required to neutralize a specified flow of acid waste from the initial pH to the required final pH. (Bell-Cornell)
W76-08225

LAND-USE MODEL FOR SERVICE AREA PROJECTION,
Brookhaven National Lab., Upton, New York, Dept. of Applied Science.
P. M. Meier.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol, 102, No. EE1, p 71-85, February 1976. 8 fig, 14 equ, 18 ref. OWRT-B-011-MASS(15).

Descriptors: *Environmental engineering, *Land use, *Management, *Sewers, *Water supply, *Waste water(Pollution), Planning, Population, Sewage, Simulation analysis, Mathematical models, Systems analysis, Equations, Forecasting.

A new method for projecting future sewer service areas is developed, based on a model of land use and intra-urban migration behavior. The derivation of a partial differential equation describing residential population density profiles through time is based on an analogy to the recharge well in an unconfined aquifer, and an adaptation of Darcy's Law. A numerical solution of this equation, coupled with an evaluation of the changes in residential density at the service area periphery, is the basis for generating successive future sewer service areas. Because the model forces the user into an investigation of land-use changes, it is suggested that the method provides a more rational basis for the specification of design year flows for interceptors and sewage treatment facilities than do the traditional subjective expedients. (Bell-Cornell)
W76-08226

DEVELOPMENT OF STORM DRAINAGE COST FUNCTIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W76-08227

DRAINAGE RUNOFF OF THE GROUNDWATER UNSTEADY FLOW TO THE DRAINS (DRENAZNY ODTOK PRI NEUSTALENOM PRUDENI PODZEMNEJ VODY K DRENOM),
For primary bibliographic entry see Field 4B.
W76-08239

LAKE MICHIGAN GETS HELP,
Milwaukee Sewerage Commission, Wis.
For primary bibliographic entry see Field 5D.
W76-08246

PUMPS FREE CITY FROM LAKE ERIE FLOODING.
For primary bibliographic entry see Field 8C.
W76-08250

WATER TREATMENT UNTOUCHED BY HUMAN HANDS - ALMOST,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5F.
W76-08266

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III - VOLUME 1--DRY WEATHER FLOWS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08278

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 4 - PROJECT SUMMARY,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08281

THE RELATIONSHIP BETWEEN WATERSHED USE AND STREAM WATER QUALITY,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 4D.
W76-08282

CHANGING HOG HAIR FROM COSTLY NUISANCE TO ASSET.
Penn Packing Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W76-08297

ECONOMICS OF IN-PLANT WASTE MANAGEMENT IN FOOD PROCESSING,
Economic Research Service, Washington, D. C. Natural Resource Economics Div.
For primary bibliographic entry see Field 3E.
W76-08300

UPDATING THE NAVY ENVIRONMENTAL PROTECTION DATA BASE TO INCORPORATE OIL SPILL CLEAN-UP PERFORMANCE,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5B.
W76-08320

GUIDELINES FOR MATERIAL PLACEMENT IN MARSH CREATION,
Center for Environment and Man, Inc., Hartford, Conn.
L. E. Johnson, and W. V. McGuinness, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A010 725, $7.50 in paper copy, $2.25 in microfiche. Contract Report D-75-2, April 1975. 225 p, 28 fig, 29 tab, 85 ref, 5 append. ARMY DACW39-74-C-0094.

Descriptors: *Marshes, *Dredging, *Spoil banks, Environment, Environmental control, Coasts, Tidal waters, Estuaries, Rivers, Vegetation, Habitat improvement, Marsh management, Wildlife habitats, Disposal, Landfills.
Identifiers: *Marsh creation, Dredged materials, Guidelines.

This report presents a systematic set of guidelines for creating new marshes from dredged material under a variety of situations and constraints. New marshes were characterized on the basis of the frequency of dredging, confinement requirements, and the need for surcharging. Pertinent information on important physical environmental factors, dredging and disposal operational practices, and engineering properties of dredged materials was used to develop guidelines for creating each type of marsh. (Sims-ISWS)
W76-08325

SELF-PURIFICATION CAPACITY OF IMPOUNDMENTS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
For primary bibliographic entry see Field 5C.
W76-08358

WATER QUALITY CRITERIA FOR GREAT LAKES WATERS TO BE USED AS MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5D.
W76-08363

OPTIMAL POLLUTION CONTROL AND TRADE IN COLLECTIVE GOODS,
State Univ. of New York, Stony Brook. Dept. of Economics.
E. James.
Journal of Public Economics, Vol. 3, No. 3, p. 203-216, 1974. 1 fig., 25 ref.

Descriptors: *Pollution abatement, *Pollution taxes(Charges), Federal government, Management, Efficiencies, Theoretical analysis, Regions, Local governments, Water pollution control.

The concept of pollution abatement by either local or national control through the imposition of a pollution tax is examined. A series of models is presented, starting with a simple no-trade, no spillover case and becoming progressively more complex. Where trade in pollution is not possible and there are no spillovers, the optimal pollution tax will vary by community and local control is probably superior to national control. Where pollution is optional, excludable and can be parcelled out among communities, trade in pollution may be possible. If multiple communities are involved in such trade, either local or national control, can, theoretically, lead to optimal control. Thus rather than being a substitute for a uniform tax, trade constitutes a necessary condition for a uniform tax to be effective. However, imposition of a single national pollution tax is not a sufficient mechanism to keep communities in optimal trade equilibrium. When communities have different attitudes toward pollution, they may gain from exchanging products with divergent pollution intensities, even if their tastes and factor endowments are otherwise identical. Trade in outputs is an imperfect substitute for trade in pollution input, and cannot equalize the marginal disutility of pollution and optimal tax rate across communities. (Auen-Wisconsin)
W76-08367

THE CHERRY CREEK-CASSELMAN RIVER ENVIRONMENTAL IMPROVEMENT PLAN,
Maryland Dept. of Natural Resources, Annapolis.
L. G. Hecht.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 767, $4.50 in paper copy, $2.25 in microfiche. Prepared for the Appalachian Regional Commission. Final Report, January 1974. 57 p, 4 tab, append (separate report), 4 map, 15 ref. ARC 72-47/RP-228.

Descriptors: Water management(Applied), *Water pollution control, Abatement, *Acid mine water, *Water quality, *Planning, *Environmental impacts, *Mine drainage, *Solid wastes, Environment, Land use, Flood control, Transportation, Maryland, Pennsylvania, *Watershed management.
Identifiers: Cherry Creek(Md), Casselman Creek(Md and Pa).

Cherry Creek Watershed (14 square miles) is entirely within Garret County, MD. Casselman River Watershed lies north of Cherry Creek Watershed and extends into PA. Land use is 18% cropland, 12% pasture, 67% woodland, and 3% other uses (mines, communities, industrial developments). Agriculture is the major industry. Some planning efforts have been undertaken: a study of Upper Casselman Watershed for water supply, flood control, and recreation; the National Freeway Study; land planning by the Department of Natural Resources; and planning by Garrett County to establish zoning regulations. Problems include: inadequate water supply, flooding on both streams, insufficient water based recreation facilities, and unclear land use planning policies. Environmental problems which are discussed include: mine drainage pollution (which has been dealt with in a separate detailed report), solid waste problems, including abandoned cars and open dumps, municipal and industrial water quality problems, and air quality problems caused by stationary sources. The final chapter ranks each of these problems according to several criteria: extent of degradation, cost of abatement, visibility of problems, and relationship to other public improvement programs. The study area is divided into six sub-regions. Cherry Creek, which is polluted only by mine drainage, is given highest priority. The North Branch Casselman River is given second priority and is polluted by mine drainage and 2 solid waste sites. Poor environmental conditions have been seen as a barrier to development of water supply and recreation, as well as a barrier to economic development. (Smith-North Carolina)
W76-08384

PREPARATION OF PLANS AND SPECIFICATIONS FOR POLLUTION ABATEMENT ACTIVITIES IN CHERRY CREEK WATERSHED, MARYLAND.
Skelly and Loy, Harrisburg, Pa.; and Zollman Associates, Inc., Baltimore, Md.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 578, $7.50 in paper copy, $2.25 in microfiche. Prepared for the Appalachian Regional Commission, Washington, D. C., July 1973. Final Report. 189 p, 4 append. ARC 73-35/RPC767.

Descriptors: Water pollution, *Water pollution control, Abatement, *Acid mine water, *Mine acids, *Coal mine wastes, *Specifications, Vegetation regrowth, Water management(Applied), Acquatic animals, *Maryland, Watershed management, Landfill, Pollution abatement.
Identifiers: *Cherry Creek watershed(Md).

This document contains detailed plans and specifications to carry out an abatement program in the Cherry Creek Watershed (MD) which has been heavily polluted by acid from mine drainage and natural sources. It is expected that abatement will improve water quality to the extent that a trout population can be re-established. More than 95% of the 28% acid load which is caused by the mining areas is expected to be eliminated by abatement. Eight pollution sources are to be treated, but it is emphasized that results will not be immediate in all cases because vegetative cover will take some time to form. In addition it is necessary to control pollution from ongoing mining operations. Specific abatement projects include regrading of strip mining sites along with establishment of suitable vegetation, surface water diversion by ditches above some mines, and deep mine sealing. Daylighting, which involves stripping out the deep mine workings, was considered but is too expensive. An estimated $298,000 is needed to accomplish the work which is to be done. Reduction in acid load will be about 723 lbs/day, or $412 per pound. Future action to ensure effectiveness of the reclamation is needed, including periodic monitoring of sealed deep mines, maintenance and inspection of regraded strip mines, limitation of livestock grazing and land use until vegetation is well established, prohibition on strip mining of sealed mines, and strict enforcement of laws. (Smith-North Carolina)
W76-08385

MINE DRAINAGE POLLUTION WATERSHED SURVEY, CHERRY CREEK, CASSELMAN RIVER WATERSHEDS, GARRETT COUNTY, MARYLAND.
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W76-08386

DEVELOPMENT OF AN OVERALL ECONOMIC/ENVIRONMENTAL PLAN FOR THE MONONGAHELA RIVER BASIN.
Gibbs and Hill, Inc., New York.
For primary bibliographic entry see Field 5C.
W76-08387

FLOATING OIL BARRIER,
Offshore Devices, Inc., Lynn, Mass. (Assignee).
J. H. Milgram.
U. S. Patent No. 3,943,720, 3 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1112, March 16, 1976.

Descriptors: *Patents, *Water quality control, *Water pollution control, Water pollution treatment, *Oil pollution, Oil spills, Oily water, Barriers, Obstruction to flow, *Separation techniques, *Pollution abatement.

An oil barrier for use in the open sea to contain oil on the surface is comprised of a flexible barrier provided with a number of flotation means only on the outside of the barrier, thereby avoiding churning of the oil and water on the inside of the barrier into an oil-water mixture that could pass under the barrier in rough sea conditions. The flotation means is composed of inflatable members packaged on the outside surface of the barrier, with a counter weight associated with the flotation means placed at the end of the flotation means opposite the barrier when it is inflated. The result is that the center of gravity of the assembly is in the desired position in relation to the center of buoyancy. (Sinha-OEIS)
W76-08396

APPARATUS FOR PUMPING OIL-WATER MIXTURE FROM A COLLECTION VESSEL OF A FLOATING OIL COLLECTOR INTO SETTLING TANKS,
A. Y. Derzhavets, P. G. Kogan, and V. I. Tabachnikov.
U.S. Patent No. 3,944,489, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1363, March 16, 1976.

Descriptors: *Patents, *Water quality control, *Water pollution control, Water pollution treatment, *Oil pollution, *Separation techniques, Settling basins, Flow, Equipment, *Pumps.
Identifiers: Oil-water mixture.

Apparatus for pumping oil-water mixture from the collection vessel of a floating oil collector into settling tanks is composed of at least one oil receiving means for collecting oil-water mixture, arranged below the level of the liquid in the collection vessel and connected through a conduit to the upper part of one of the settling tanks. Besides, the apparatus includes means providing for vertical displacement of the oil receiving means and a pump for pumping water from the lower part of one of the settling tanks outboard of the floating oil collector and an aspirating air-water jet ejector for maintaining substantially permanent vacuum in each settling tank. The ejector has the air line connected to the upper part of each settling tank and the jet is connected to the delivery side of the pump. The lower part of one of the settling tanks is connected to the upper part of that settling tank from the lower part of which this pump draws water. The liquid column established in the conduit connecting the oil receiving means with the upper part of the settling tank is higher than the liquid column established in the other conduit. (Sinha - OEIS)
W76-08403

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W76-08411

THE TOXICITY OF VARIOUS MINING FLOTATION REAGENTS TO RAINBOW TROUT (SALMO GAIRDNERI),
Sir George Williams Univ., Montreal (Quebec). Dept. of Biological Sciences; and Sir George Williams Univ., Montreal (Quebec). Water Pollution Research Lab.
For primary bibliographic entry see Field 5C.
W76-08448

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y.
For primary bibliographic entry see Field 7C.
W76-08507

NITRATE REDUCTION AND ASSOCIATED MICROBIAL POPULATIONS IN A PONDED HANFORD SANDY LOAM,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
M. G. Volz, L. W. Belser, M. S. Ardakani, and A. D. McLaren.
Journal of Environmental Quality, Vol. 4, No. 1, p 99-102, January-March 1975. 1 fig, 3 tab, 21 ref.

Descriptors: *Nitrates, *Denitrification, Soils, Soil investigations, *Soil bacteria, Nitrites, Water quality control, Loam.
Identifiers: *Nitrate reduction, Microbial ecology.

A field plot of Hanford sandy loam was ponded for 2 weeks with a solution of KNO3 and CA(NO3)2 containing 100 ppm NO3-N in order to measure short term denitrification rates as well as growth and distribution of bacteria capable of reducing nitrate to nitrite and/or N20 and N2. Denitrifying bacteria generally decreased in number with depth and time and were not as numerous as nitrate reducers. (Skoberboe-Colorado State)
W76-08546

TRANSFER OF BORON AND TRITIATED WATER THROUGH SANDSTONE,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-08547

WATER QUALITY IN THE MAD RIVER BASIN, HUMBOLDT AND TRINITY COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-08562

PHYTOPLANKTON IN NORTHERN DONETSK PONDS FOR ADDITIONAL TREATMENT, (IN UKRANIAN),
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Inst. of Hydrobiology; and Dnepropetrovskii Gosudarstvennyi Universitet (USSR).
For primary bibliographic entry see Field 5C.
W76-08577

EVALUATION OF MINERALIZATION PROCESSES FOR SRP WASTES,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
G. H. Thompson.
Available from the National Technical Information Service, Springfield, Va 22161, as DP-1389, $3.50 in paper copy, $2.25 in microfiche. 16 p, 4 tab, 3 fig, 12 ref. ERDA AT (07-2)(1).

Descriptors: *Radioactive wastes, *Cesium, *Sludge, Separation techniques, *South Carolina, Ziolites, Waste treatment.
Identifiers: Savannah River Plant(SC), Mineralization processes.

Radioactive wastes from the SRP consist of an insoluble sludge containing most of the actinides and fission products except cesium and a supernate which contains most of the cesium. Means of separating the sludge and the cesium from a relatively nonradioactive residue were investigated. Mineralization or a possible method of solidification were investigated. Cesium could be removed from the waste supernate and fixed in zeolite. By reacting alkaline cesium-containing waste with kaolinite, sodalite and cancrinite can be prepared with volume increases up to 285 times that of the zeolite product and leachabilties at least 10000 times that of the zeolite product. Reaction of cesium with bentonite and kaolinite produced a power, pollucite but net all of the cesium reacted. Cesium leachabilities or product volumes of the minerals was not affected by gamma doses of 10 to the 10th power. Simulated sludge was solidified by reaction with sodium hydroxide and silica gel. (Chilton-ORNL)
W76-08595

NATURAL AND AGRICULTURAL ECOSYSTEMS,
Tasmanian Coll. of Advanced Education, Launceston.
For primary bibliographic entry see Field 6G.
W76-08667

CALCULATED DRAINAGE WATER COMPOSITIONS AND SALT BURDENS RESULTING FROM IRRIGATION WITH RIVER WATERS IN THE WESTERN UNITED STATES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 5B.
W76-08671

WATER QUALITY IN IRRIGATED WATERSHEDS,
California Univ., Riverside. Dept. of Soil Science Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08679

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ. Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-08730

NUMERICAL PREDICTION OF THERMAL-REGIME OF RIVERS,
Nalco Environmental Sciences, Northbrook, Ill. Physical Science Div.
For primary bibliographic entry see Field 5B.
W76-08739

FAST CURRENT OIL CONTROL STUDY,
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
W. P. Graebel, and V. A. Phelps.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-009 040, $7.50 in paper copy, $2.25 in microfiche. Report No. CG-D-84-75, August 1974. 195 p, 10 fig, 4 tab, 10 ref, 6 append. DOT-CG-32430-A.

Descriptors: *Model studies, *Oil spills, *Oil pollution, Hydraulic models, Water pollution, Currents(Water), Water pollution control, Pollution abatement, Oil, Oil wastes, Oily water, Oil-water interfaces, *Barriers, Instrumentation, Equipment.
Identifiers: *Oil recovery, Oil recovery devices, Oil herding devices.

Model studies of oil containment barriers and herding devices were conducted in an open channel of six foot width and three and one-half foot depth. Currents up to four feet per second were used with three different oils. Incipient failure of the barriers occurred for values of the densimetric Froude number of about unity. Trajectories of the oil drops at incipient failure were given. Oil herding devices were tested at various angles to the current. This performance in regard to loss rates was superior to that of the barriers, and improved as the angle between current and herder was decreased. Multiple barriers and barriers with nets were also tested. No substantial improvement was found over that for a single barrier. A vortex oil recovery device was conceived and tested, which showed only very small loss rates at all speeds tested. Its rate of recovery of a slick increased with current speed. (Sims-ISWS)
W76-08748

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AN OPTIMIZATION MODEL FOR REGIONAL WATER QUALITY MANAGEMENT,
Lehigh Univ. Bethlehem, Pa. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-08104

ECONOMIC CONCEPTS AND TECHNIQUES PERTAINING TO WATER SUPPLY, WATER ALLOCATION, AND WATER QUALITY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08152

WATER ALLOCATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08154

CONTROL OF ACID MINE DRAINAGE.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08156

MODELS OF ACTUAL COMMUNITIES,
For primary bibliographic entry see Field 8I.
W76-08219

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ. Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-08730

6B. Evaluation Process

IDENTIFICATION, MEASUREMENT, AND INCORPORATION OF ENVIRONMENTAL QUALITY OBJECTIVES IN NATURAL RESOURCE DEVELOPMENT,
Iowa State Univ., Ames. Dept. of Economics.
H. D. Schellenberg.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 250, $9.25 in paper copy, $2.25 in microfiche. PhD thesis, 1973. 296 p. 7 fig., 21 tab., 92 ref., 5 append. OWRT B-037-IA (1).

Descriptors: *Social aspects, *Environment, *Psychological aspects, *Evaluation, *Resources development, Methodology, Estimating, Multiple-purpose reservoirs, Model studies, Cost-benefit analysis, Project planning, Surveys, Environmental effects, *Iowa.
Identifiers: *Environmental quality, Pareto efficiency, Ames Reservoir(Iowa), Skunk River(Iowa), Trade-offs.

The problem of identifying and measuring the effect of proposed reservoirs upon environmental quality was approached by inquiring into the nature of amenity services flowing from natural resources at reservoir sites. Procedures for incorporating amenity possibilities were developed by use of the maximum GNP and broad productivity criteria (not dependent upon the measurement of utility, but equity considerations could be noted.) A public survey was designed which ranked the contribution of seven resource categories to amenity values and to provide estimates of the magnitude of amenity benefits arising from preservation so that benefits and costs of the proposed Ames Reservoir on the Skunk River, Iowa, could be made. Some parameters of the evaluation were: Estimation of net monetary benefits from reservoir construction, determination of the physical magnitude of reservoirs upon natural resources which might provide amenity services; determination of the relative importance in providing amenity services, which when combined with the physical magnitude of the reservoir's contribution to amenity provided an aggregate index of alternatives; identification of trade-off curves from reservoir net benefits to represent economic development, and an aggregate index measure of environmental quality; monetary measurement of amenity services by willingness-to-pay was applied to an alternative plan, and Pareto-betterment was identified if a trade-off or production-possibility curve was identified. (Auen-Wisconsin)
W76-08101

EFFICIENT RESOURCE UTILIZATION WITHIN A REGIONAL FRAMEWORK.
Iowa State Univ., Ames. Dept. of Economics.
B. A. AbuKishk.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 194, $9.25 in paper copy, $2.25 in microfiche. PhD thesis, 1973. 250 p. 26 fig., 54 tab., 108 ref., 2 append. OWRT B-042-IA (1).

Descriptors: *River basin development, *Resources development, *Environmental effects, *Flood control, *Erosion control, Soil conservation, *Iowa, Agriculture, Cost sharing, Industries, Water utilization, Employment, Linear programming, Model studies, Indirect costs, Planning, Human population, Labor supply, Sediment yield, Damages, Cost-benefit analysis, Indirect benefits, Drainage systems, Crops, Livestock, Appreciation, Value, Optimization.

Identifiers: *Skunk River Basin(Iowa), Demography, Nutrient losses.

The Skunk River Basin, Iowa, was the prototype for information of interrelationships between improving resource use, employment opportunity, and environmental quality, with emphasis on soil conservation practices and reduction in flood damage. The study evaluated the optimal mix of activities at quinquennial time periods, 1970-1985, in the agricultural and industrial sectors subject to environmental constraints, the impact of particular land use policies with respect to financing soil conservation, to what extent erosion control can modify the need for large dam construction, developed a linear programming model, and arrived at recommendations subject to specified limitations. The findings indicate that optimal resource allocation can be obtained at an erosion level within the range 1-5 tons/acre; financing soil conservation at a low interest rate allows achievement of the highest possible net income at a lower erosion level; there is a limited substitutability between erosion level and public cost; the possibility for expansion in the manufacturing sector is very good; but expansion of this sector may increase the waste quantities discharged into the Skunk River; the optimal solution suggests that soil erosion must be limited on class three land by either terracing or cover crops. The model can be extended for interregional planning. (Auen-Wisconsin)
W76-08102

ECONOMIC CONCEPTS AND TECHNIQUES PERTAINING TO WATER SUPPLY, WATER ALLOCATION, AND WATER QUALITY,
Institute for Water Resources (Army), Fort Belvoir, Va.
E. D. Bovet.
IWR Paper 75-P5, December 1975. 302 p, 17 fig. DACW31-76-M-0435.

Descriptors: *Planning, *Economic efficiency, *Water supply, Groundwater, Costs, Optimization, *Water allocation(Policy), Inter-basin transfers, Water treatment, Reservoir operation, Cost allocation, Pollution abatement, *Water quality, Acid mine water, Water reuse, Water demand, Damages, Desalination, Industrial water, Sewerage, Water quality standards, Thermal pollution, Water yield, Water shortage.

A condensation of several Army Engineer Institute for Water Resources studies provides guidelines to the water resource planner. The three part format is divided into nine sections specifically relevant to planning for surface water supply by estimating water demand and sizing water supply, planning for ground water supply and mixed water use. Water supply costs, the risk of water supply shortages and industry's response to changing water costs are evaluated. Interregional planning for water resources allocation is based on studies conducted in Utah and deals with allocation in an urbanizing agricultural region, a statewide water resource allocation model, inter-basin water transfers for agriculture, and demand for agricultural water. Planning for water quality deals with water quality concepts, water quality enhancement technology and costs, water quality benefits, and water quality optimization. Consideration is given for the rationale for wastewater reuse as a potable supply, safety of reused wastewater, economic efficiency, acceptability, and the results of a mathematical model present cost comparisons. The economic feasibility of acid mine drainage control and land reclamation are discussed as they relate to a small strip mine. (See W76-08152 thru W76-08156) (Auen-Wisconsin)
W76-08152

WATER SUPPLY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 4A.
W76-08153

WATER ALLOCATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
In: 'Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality' IWR Paper 75-P5, December 1975, Part Two. 89 p, 12 fig. DACW31-76-M-0435.

Descriptors: *Optimization, *Planning, *Water allocation(Policy), *Economic efficiency, Decision making, Mathematical models, Systems analysis, Utah, Interbasin transfers, Costs, Water demand, Watersheds(Basins), Industrial water, Municipal water, Irrigation water.
Identifiers: Interregional planning.

The details of an optimal solution, integrating various aspects of a statewide water allocation problem, is presented as a tool for interregional water resource planning. The solution to the problem involves the determination of cost schedules and supply functions for water in various uses. By means of a linear programming model, the economically efficient water allocation can be computed for present and projected demographic conditions. The inclusion of demand and supply analyses as separate components of the model avoids the problems involved in least-cost planning for projected demands. In the Utah study, the marginal, or least productivity activity turned out to be the agricultural use, which is highly sensitive to rising costs. Multiple demands can be usefully included in a mathematical model, so that efficient allocations among uses can be determined directly. Costs of policies deviating from efficient allocations can be determined using supply functions, demand functions, or both. From these costs, public decision makers can readily analyze results of alternative decisions. Hydrologic modeling also can be effectively included in a mathematical programming allocation model. Once the model is constructed, changes in structure or coefficients can be carried out at little cost relative to their usefulness in planning. (See also W76-08152) (Auen-Wisconsin)
W76-08154

WATER QUALITY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08155

CONTROL OF ACID MINE DRAINAGE.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08156

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, PLANNING.
Wise (Harold F.) and Associates, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08192

THE WATER POLLUTION CONTROL ACT OF 1972 INSTITUTIONAL ASSESSMENT, ATTITUDES OF PARTICIPANTS.
Oregon Research Inst., Eugene.
For primary bibliographic entry see Field 5G.
W76-08221

REASSESSMENT OF THE CROSS-FLORIDA BARGE CANAL: A PROBABILITY APPROACH,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 4A.
W76-08228

ATTITUDES AND PUBLIC PARTICIPATION ON THE HIGH PLAINS TOWARD GROUND-

WATER PLANNING AND MANAGEMENT INSTITUTIONS,
Texas Tech Univ., Lubbock. Dept. of Political Science.
F. L. Baird, and R. E. Smith.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 519, $4.50 in paper copy, $2.25 in microfiche. Completion Report, May, 1976. 64 p, 29 tab. OWRT A-027-TEX(1) 14-31-0001-5044 14-34-0001-6045.

Descriptors: Irrigation, Distribution, *Groundwater, *Attitudes, *Groundwater movement, Planning, *Water management(Applied), *Texas, *Great Plains, *Institutional constraints, Regulation.
Identifiers: Farmer opinions, Federal subsidies, Federal or state regulation.

In those counties in Texas where irrigation is still developing and confidence in the future supply of adequate groundwater is high, there will be strong opposition to any form of public groundwater management and planning. With irrigation relatively well developed and the recognition through education and/or experience that groundwater is not unlimited, the county's farmers will be more inclined to join an Underground Water Conservation District (UWCD), as it most closely conforms to their basic philosophy. This process may speed up if there is an influx of farmers from depleted areas determined not to repeat past mistakes. On the other hand, the process may be impeded due to such factors as uneven distribution of groundwater, historical antagonisms, leadership struggles, and the like. Nevertheless, in general, farmer opinion appears to be most united behind UWCD's while an area is enjoying its peak period of irrigation and in the stages of decline. By the time groundwater depletion becomes severe and farmers feel they are in a crisis situation, the cohesiveness of their opinions backing UWCD's gradually dissipates. Irrigation farmers faced with loss of groundwater seek remedies in direct federal subsidies; others advocate federal or state regulation financed by the general taxpayers' money; a substantial but a diminished portion remain loyal to the UWCD, but advocate more vigorous use or increase of its powers; and others turn against all public management so they can gain complete freedom in using what groundwater they have left.
W76-08375

THE HALTON-WENTWORTH WATERFRONT STUDY, VOLUME 1, CONCEPTS FOR WATERFRONT DEVELOPMENT (SUMMARY).
Acres Consulting Services Ltd., Niagara Falls (Ontario).
June 1974. 27 p, 5 plates, 1 map.

Descriptors: *Land use, *Planning, *Open space, Economics, *Lake Ontario, *Lake shores, *Water quality, *Shore protection, Erosion, Area redevelopment, Recreation, Fish, Streams, Air pollution, Parks, Transportation, *Canada.
Identifiers: Halton(Ontario), Hamilton-Wentworth(Ontario), *Waterfront development, Public participation, Stream valley protection, Hamilton Harbour(Hamilton-Wentworth(Ontario).

Recommendations are summarized from a larger report which was intended to provide guidelines for future development, and was largely developed out of a ten month public participation program. Some objectives for this waterfront area are: maintain the existing land use pattern while increasing the amount of well distributed open space; increase the amount of public shoreline from the present 20% to 40%, and eventually secure access to the entire shore; provide more open space and recreation opportunities on land and water; protect unique features of the area; improve water and air quality; preserve stream valleys as an important resource; preserve fish and wildlife; establish planning and design controls for

residential and commercial development on the shore; allow for transportation; and preserve and improve industrial and port areas as essential components of the economic base of the region. The two adjacent planning areas, the Regional Municipality of Halton and the Regional Municipality of Hamilton-Wentworth, come together on the shores of Lake Ontario in the Province of Ontario. There are 13 areas of concern along the 60 miles of shore. An estimated cost of $223.7 million includes construction, land acquisition, development and some relocation of facilities. A recommended cost sharing is given which indicates that the Province would bear the heaviest burden, $79 million, reflecting that policy and overall planning is necessary at that level for much of the development. (Smith-North Carolina)
W76-08382

PRESENT AND FUTURE MULTIPLE USE DEMANDS ON THE PINYON-JUNIPER TYPE,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08430

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT, AND DEVELOPMENT OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, Md.
H. L. Loats, T. R. Fowler, and S. Frech.
Available from the National Technical Information Service, Springfield, Va. 22161, as N75 18669, $5.50 in paper copy, $2.25 in microfiche. Quarterly Progress Report 74-C-3-1, October 30, 1974. 118 p, 5 fig, 6 tab, 12 append. NASA NAS 5-20567.

Descriptors: *Data collections, *Hydrologic data, *Computer models, *Remote sensing, *Satellites(Artificial), Monitoring, Telemetry, Water resources, Model studies, Computers, Federal government, State governments, Water management(Applied), Water resources development.
Identifiers: *Water resources users.

A survey of the principal water resource users was conducted to determine the impact of new remote data streams on hydrologic computer models. The analysis of the responses and direct contact demonstrated that: (1) the majority of water resource effort of the type suitable to remote sensing inputs is conducted by eleven major federal water resources agencies or through federally stimulated research, (2) the federal government develops most of the hydrologic models used in this effort, and (3) federal computer power is extensive. The computers, computer power, and hydrologic models in current use were determined. The effort in the remainder of the contract will be directed toward analyzing the effect of feasibility and timing of introduction of new data streams by contrasting the current trends of water resource users, both with and without remote sensing data. (Morris - ISWS)
W76-08536

UTILIZATION OF ERTS-1 DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4A.
W76-08538

A FRAMEWORK FOR EVALUATING INSTITUTIONAL AND SOCIO-ECONOMIC ISSUES OF LAND TREATMENT OF WASTE WATER,
Economic Research Service, Upper Darby, Pa.
For primary bibliographic entry see Field 5D.
W76-08681

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 1-5 MGD PLANTS, PLANTS FOR HIGH PRODUCT RECOVERY,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08118

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 3-25 MGD LOW PRESSURE PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08119

WHAT DOES A 'CLEAN' ENVIRONMENT COST,
Houston Univ., Tex.
For primary bibliographic entry see Field 5G.
W76-08150

WATER SUPPLY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 4A.
W76-08153

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, TEXTILE INDUSTRY.
Lockwood Greene Engineers, Inc., Spartanburg, S. C.
For primary bibliographic entry see Field 5G.
W76-08186

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, CANNED AND PRESERVED FRUITS AND VEGETABLES,
Environmental Associates, Corvallis, Oreg.
For primary bibliographic entry see Field 5G.
W76-08187

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE ORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08188

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE INORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08189

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES PETROLEUM REFINING INDUSTRY, PART 1, CHAPTERS -V.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08190

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, PETROLEUM REFINING INDUSTRY, PART 2, CHAPTERS VI - IX.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08191

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, CONSTRUCTION GRANTS.
Touche, Ross and Co., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08194

AN ANALYSIS OF U. S. ENVIRONMENTAL PROTECTION AGENCY'S NEEDS SURVEY,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-08195

DEVELOPMENT OF STORM DRAINAGE COST FUNCTIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W76-08227

ECONOMICAL FOAM CONTROL IN WASTE-WATER TREATMENT SYSTEMS,
Nalco Chemical Co., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-08249

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS SEA WATER DESALTING PLANTS, DESIGN OF 1-10 MGD SEAWATER PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08284

ALTERNATIVES FOR REDUCING WATER POLLUTION IN CATTLEHIDE PROCESSING AND TANNING,
Economic Research Service, Washington, D. C. National Economic Analysis Div.
For primary bibliographic entry see Field 3E.
W76-08285

NEW APPROACHES POINT TO BETTER ECONOMIES IN HIDE PROCESSING,
For primary bibliographic entry see Field 3E.
W76-08288

OPTIMAL POLLUTION CONTROL AND TRADE IN COLLECTIVE GOODS,
State Univ. of New York, Stony Brook. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-08367

DEVELOPMENT OF AN OVERALL ECONOMIC/ENVIRONMENTAL PLAN FOR THE MONONGAHELA RIVER BASIN.
Gibbs and Hill, Inc., New York.
For primary bibliographic entry see Field 5C.
W76-08387

ECONOMIC EVALUATION OF PROPOSED WATER CONSERVATION PRACTICES ON ESTABLISHED IRRIGATION DISTRICTS: A GENERAL METHODOLOGY AND APPLICATION TO THREE DISTRICTS IN OREGON,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 3F.
W76-08431

SOIL LOSS FROM ILLINOIS FARMS - ECONOMIC ANALYSIS OF PRODUCTIVITY LOSS AND SEDIMENTATION DAMAGE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4D.
W76-08533

DESALTING HANDBOOK FOR PLANNERS.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 3A.
W76-08584

RESOURCE RECOVERY: POSSIBILITIES AND PITFALLS,
International City Management Association, Washington, D.C. Management Development Center.
For primary bibliographic entry see Field 5D.
W76-08692

REFUSE INTO POWER,
Louisville Univ., Ky. Dept. of civil Engineering.
For primary bibliographic entry see Field 5D.
W76-08693

FLUORIDE REMOVAL: TECHNOLOGY AND COST ESTIMATES,
For primary bibliographic entry see Field 5D.
W76-08703

MUNICIPAL INDUSTRIAL WASTE PROGRAM NETS $8.9 MILLION IN TWO YEARS.
For primary bibliographic entry see Field 5D.
W76-08712

6D. Water Demand

RESIDENTIAL WATER CONSERVATION,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 3D.
W76-08103

THE WATER SUPPLY SYSTEM OF A LARGE URBAN AGGLOMERATION IN SWITZERLAND (DIE WASSERVERSOWGUNG EINER SCHWEIZERISCHEN GROSS-AGGLOMERATION),
For primary bibliographic entry see Field 5F.
W76-08233

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y.
For primary bibliographic entry see Field 7C.
W76-08507

6E. Water Law and Institutions

ENVIRONMENTAL QUALITY AND INFLATION: A REGIONAL PERSPECTIVE ON THE COST-PUSH IMPACT OF THE 1972 PURE WATER LEGISLATION,
Lyndon B. Johnson School of Public Affairs, Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08151

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, PLANNING.
Wise (Harold F.) and Associates, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08192

THE WATER POLLUTION CONTROL ACT OF 1972 INSTITUTIONAL ASSESSMENT, ATTITUDES OF PARTICIPANTS.
Oregon Research Inst., Eugene.
For primary bibliographic entry see Field 5G.
W76-08221

OPTIMAL POLLUTION CONTROL AND TRADE IN COLLECTIVE GOODS,
State Univ. of New York, Stony Brook. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-08367

ECONOMIC EVALUATION OF PROPOSED WATER CONSERVATION PRACTICES ON ESTABLISHED IRRIGATION DISTRICTS: A GENERAL METHODOLOGY AND APPLICATION TO THREE DISTRICTS IN OREGON,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 3F.
W76-08431

A FRAMEWORK FOR EVALUATING INSTITUTIONAL AND SOCIO-ECONOMIC ISSUES OF LAND TREATMENT OF WASTE WATER,
Economic Research Service, Upper Darby, Pa.
For primary bibliographic entry see Field 5D.
W76-08681

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, UNIT 2, SAN BENITO, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08376

FLOOD PLAIN INFORMATION: ALAMO AND ULATIS CREEKS, VACAVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08377

FLOOD PLAIN INFORMATION: EEL RIVER--STAFFORD TO HOLMES, HUMBOLDT COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08378

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, PACHECO CREEK, SAN BENITO COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08379

FLOOD PLAIN INFORMATION: SAN ANTONIO CREEK AND TRIBUTARIES, VICINITY OF OJAI, VENTURA COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08380

FLOOD PLAIN INFORMATION: PURGATOIRE RIVER AND TRIBUTARIES, VICINITY OF TRINIDAD, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-08381

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND TRIBUTARIES, GREAT BEND, KANSAS, TO JOHN MARTIN DAM, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-08388

FLOOD PLAIN INFORMATION: SALINE RIVER AND TRIBUTARIES, BENTON, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W76-08389

FLOOD PLAIN INFORMATION: COLORADO RIVER AND RIFLE, GOVERNMENT, HUBBARD GULCH CREEKS, RIFLE, COLORADO.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08390

6G. Ecologic Impact Of Water Development

IDENTIFICATION, MEASUREMENT, AND INCORPORATION OF ENVIRONMENTAL QUALITY OBJECTIVES IN NATURAL RESOURCE DEVELOPMENT,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-08101

EFFICIENT RESOURCE UTILIZATION WITHIN A REGIONAL FRAMEWORK.
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-08102

WHAT DOES A 'CLEAN' ENVIRONMENT COST,
Houston Univ., Tex.
For primary bibliographic entry see Field 5G.
W76-08150

THE HALTON-WENTWORTH WATERFRONT STUDY, VOLUME 1, CONCEPTS FOR WATERFRONT DEVELOPMENT (SUMMARY).
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 6B.
W76-08382

THE CHERRY CREEK-CASSELMAN RIVER ENVIRONMENTAL IMPROVEMENT PLAN,
Maryland Dept. of Natural Resources, Annapolis.
For primary bibliographic entry see Field 5G.
W76-08384

PREPARATION OF PLANS AND SPECIFICATIONS FOR POLLUTION ABATEMENT ACTIVITIES IN CHERRY CREEK WATERSHED, MARYLAND.
Skelly and Loy, Harrisburg, Pa.; and Zollman Associates, Inc., Baltimore, Md.
For primary bibliographic entry see Field 5G.
W76-08385

MINE DRAINAGE POLLUTION WATERSHED SURVEY, CHERRY CREEK, CASSELMAN RIVER WATERSHEDS, GARRETT COUNTY, MARYLAND.
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W76-08386

DEVELOPMENT OF AN OVERALL ECONOMIC/ENVIRONMENTAL PLAN FOR THE MONONGAHELA RIVER BASIN.
Gibbs and Hill, Inc., New York.
For primary bibliographic entry see Field 5C.
W76-08387

ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W76-08510

CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS, A SELECTED, ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Information Center.
For primary bibliographic entry see Field 5C.
W76-08592

TRANSURANIUM NUCLIDES IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-08597

NATURAL AND AGRICULTURAL ECOSYSTEMS,
Tasmanian Coll. of Advanced Education, Launceston.
D. F. Smith, and D. M. Hill.
Journal of Environmental Quality, Vol. 4, No. 2, p 143-145, April-June 1975. 1 fig.

Descriptors: *Ecosystems, Agriculture, Management.
Identifiers: *Managed ecosystems, *Biological diversity.

It is argued that the task of creating awareness of environmental problems will require more than the bringing together of papers from a range of disciplines. It will depend on new consciousness and channels of communication. As an example of problems with terms, this paper analyses the use of natural and agricultural ecosystems, suggesting that on all valid criteria these form a continuum, rather than two discrete systems. (Skogerboe-Colorado State)
W76-08667

7. RESOURCES DATA

7A. Network Design

THE ESTIMATION OF LOCAL RAINFALL BY SAMPLE GAUGING,
For primary bibliographic entry see Field 2B.
W76-08348

EASTERN LAKE ONTARIO PRECIPITATION NETWORK,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2B.
W76-08412

THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-08537

INTERSTATION CORRELATION OF PEAK-FLOW ESTIMATES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-08555

DESIGN OF GROUND-WATER LEVEL OBSERVATION NETWORK.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-08563

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 2B.
W76-08694

7B. Data Acquisition

THE STUDY OF FRESH-WATER LAKE ICE USING MULTIPLEXED IMAGING RADAR,
Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
For primary bibliographic entry see Field 2C.
W76-08138

LAKE HURON SURFACE WATER TEMPERATURE, MAY-NOVEMBER, 1966,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Lab.
For primary bibliographic entry see Field 2H.
W76-08141

THE THEORY AND APPLICATIONS OF OCEAN WAVE MEASURING SYSTEMS AT AND BELOW THE SEA SURFACE, ON THE LAND, FROM AIRCRAFT, AND FROM SPACECRAFT,
City Univ. of New York. Inst. of Oceanography.
W. J. Pierson.
NASA Contractor Report 2646, January 1976. 388 p, 65 fig, 15 tab, 257 ref. NASA NAS 5-20041.

Descriptors: *Remote sensing, *Ocean waves, *Waves(Water), Instrumentation, Measurement, Equipment, Photography, Aerial photography, Aircraft, Satellites(Artificial), Ships, Oceans, Radar, Oceanography.

Nearly all of the known methods for measuring and analyzing ocean waves are described, including those presently in use on spacecraft and planned for SEASAT-A. Potential difficulties with synthetic aperture systems for a spacecraft were described and an alternate design is suggested. The different methods can yield different kinds of spectra and other kinds of imagery. Ways to compare different kinds of data were given. The scientific and practical applications of data from spacecraft were given. (Sims - ISWS)
W76-08145

EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7C.
W76-08147

EVALUATION OF METHODS FOR PRESERVING THE LEVELS OF SOLUBLE INORGANIC PHOSPHORUS AND NITROGEN IN UNFILTERED WATER SAMPLES,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
For primary bibliographic entry see Field 5A.
W76-08157

METHOD OF STUDYING THE SPATIAL DISTRIBUTION OF ORGANISMS, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science; and Moscow State Univ. (USSR). Dept. of Invertebrate Zoology.
Y. E. Romanovskii, and A. V. Smurov.
Zh Obshch Biol. 36(2), p 227-236, 1975.

Descriptors: *Spatial distribution, Methodology, Aquatic animals, Distribution patterns, Plankton, Model studies, Algorithms.
Identifiers: Calanus-Glacialis, Carabidae, Elateridae, Metridia-Longa, Staphylinidae, *Aggregation indices(Organisms).

A method is proposed which allows the application of theoretical statistical distributions as well as aggregation indices to sample data. The method is based on the relationship between theoretical distributions and ideal aggregation indices. The abstract character of ideal indices is overcome by the introduction of a new index KA equal to the ratio of the area free from aggregation to the total area under study. On the basis of the relationship between the index KA and the I index of Morisita the ecological significance of the latter is determined. Aggregation dynamics in populations is discussed by means of the following statistics: m*; the mean density of organisms in aggregations; m*, the mean density of organisms in the area under study; and KA = 1 - m(-)/m*; the new aggregation index. An algorithm of the spatial distribution of organisms is proposed, exemplified by plankton microdistribution, soil mesofauna and model distributions. (Metridia longa, Calanus glacialis, Carabidae, Elateridae and Staphylinidae are used as examples.)--Copyright 1976, Biological Abstracts, Inc.
W76-08176

IRRIGATION SIGNALLING DEVICE,
For primary bibliographic entry see Field 3F.
W76-08196

METHOD FOR LOCATING AND EVALUATING GEOTHERMAL SOURCES OF ENERGY BY SENSING ELECTROSTATIC VOLTAGE GRADIENTS,
For primary bibliographic entry see Field 4B.
W76-08204

MEASURING WATERSHED LAND-USE CHANGES WITH AIRPHOTOS,
Clemson Univ., S. C. Dept. of Civil Engineering.
D. B. Stafford, J. T. Ligon, and M. E. Nettles.
Transportation Engineering Journal, Proceedings of the American Society of Civil Engineers, Vol. 102, No. TE1, p 117-129, February, 1976. 4 fig, 2 tab, 5 ref. OWRT A-024-SC(6)

Descriptors: Water resources, *Watersheds(Basins), Hydrology, *Land use, *South Carolina, *Photogrammetry, *Aerial photography, Agriculture, Drainage, Floods, Mapping, *Remote sensing, Flow, Runoff, *Urbanization.

Aerial photographs were used to determine land use changes over a 25-year period in two watersheds in western South Carolina. The North Tyger River watershed near Spartanburg, South Carolina experienced changes in agricultural land use and the Reedy River watershed exhibited a conversion of rural land use to urban land use because of the urbanization occurring in the Greenville, S. C. urban area over the study period. Aerial photographs taken at approximately 5-year intervals were used to classify and measure the areas of various land-use classes in the two watersheds. The individual land-use parcels were measured by using a planimeter on aerial photographic enlargements. Significant changes in land use were observed in the two watersheds, changes that would be expected to have an important effect on the hydrologic response of the watersheds. The results obtained from the study indicate that the use of aerial photographs represents a satisfactory approach. (Bell-Cornell)
W76-08229

ABOUT THE PROBLEM OF DIRECT RUNOFF DETERMINATION BY SEPARATION OF THE HYDROGRAPH COMPONENTS (K OTAZKE URCENIA PRIMAEHO ODTOKU SEPARACIOU PRIETOKOVYCH VLN),
For primary bibliographic entry see Field 2A.
W76-08238

ULTRASONIC RIVER FLOW MEASUREMENT,
Atomic Energy Research Establishment, Harwell (England).
W. R. Loosemore.
Ultrasonics, Vol. 11, No. 5, p 195-196, September 1973. 2 fig.

Descriptors: *Instrumentation, *Flow rates, *Ultrasonics, Rivers, Water levels, Computers, Measurement, Automation, Equipment.
Identifiers: Flowmeters.

An ultrasonic flowmeter which will directly measure total flow rates in rivers has been developed by the Water Resources Board and the Atomic Energy Research Establishment in Harwell, England. The equipment offers no obstruction to the river flow and operate automatically and continuously. Measurements are made at pre-selected intervals, usually every 15 minutes, and the result is displayed locally in numerical form and then transferred to eight-hole punched paper tape in computer-compatible form. Water level is also measured as part of the sequence by a resistance level gage and again displayed in numerical form; readings are not affected by the condition of the year. The data is then automatically combined with the ultrasonically-determined velocity to computevolumetric flow rate. (Sandoski-FIRL)
W76-08241

NEW METHODS FOR ECOLOGICAL ANALYSIS OF MICROORGANISMS OF EUTROPHIC WATERS, (IN SPANISH),
Institute National de Limnologia, Santo Tome (Argentina).
For primary bibliographic entry see Field 5A.
W76-08252

ALTERNATIVE METHODS OF ESTIMATING SNOW WATER PARAMETERS,
Idaho Univ., Kimberly. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W76-08259

THE RELATIONSHIP BETWEEN WATERSHED USE AND STREAM WATER QUALITY,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 4D.
W76-08282

ERTS-1 INVESTIGATION OF WETLANDS ECOLOGY,
American Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W76-08319

UPDATING THE NAVY ENVIRONMENTAL PROTECTION DATA BASE TO INCORPORATE OIL SPILL CLEAN-UP PERFORMANCE,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5B.
W76-08320

EVALUATION OF GLACIER MASS BALANCE BY OBSERVING VARIATIONS IN TRANSIENT SNOWLINE POSITIONS,
Norwegian Water Resources and Electricity Board, Oslo.
For primary bibliographic entry see Field 2C.
W76-08322

LASER APPLICATIONS TO ATMOSPHERIC SCIENCES - A BIBLIOGRAPHY,
Old Dominion Univ., Norfolk, Va.
For primary bibliographic entry see Field 10C.
W76-08323

INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4A.
W76-08326

ESTIMATING WATER SALINITY WITH GEOPHYSICAL EARTH RESISTIVITY EQUIPMENT,
Agricultural Research Service, Sidney, Mon.
For primary bibliographic entry see Field 2K.
W76-08332

A SIMPLE CONTINUOUS-FLOW RESPIROMETER FOR COMPARATIVE RESPIRATORY CHANGES IN MEDIUM-SIZED AQUATIC ORGANISMS,
Texas Christian Univ., Fort Worth. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08353

RAIN GAUGE,
For primary bibliographic entry see Field 2B.
W76-08397

MEASUREMENTS OF CURRENT FLOW DURING SUMMER IN LAKE HURON,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2H.
W76-08413

A COMPARISON OF MANUALLY DIGITIZED RADAR DATA AND OBSERVED COOL SEASON PRECIPITATION OVER THE SOUTHERN APPALACHIANS,
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W76-08414

ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W76-08510

ENVIRONMENTAL MONITORING FROM SPACECRAFT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W76-08532

ANALYSIS OF ERTS-1 IMAGERY OF WYOMING AND ITS APPLICATION TO EVALUATION OF WYOMING'S NATURAL RESOURCES,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W76-08535

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT, AND DEVELOPMENT OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, Md.
For primary bibliographic entry see Field 6B.
W76-08536

THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-08537

UTILIZATION OF ERTS-1 DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4A.
W76-08538

WATER USE BY SALTCEDAR AS MEASURED BY THE WATER BUDGET METHOD,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 2D.
W76-08573

AN AQUATIC TECHNIQUE FOR COLLECTING SMALL ADULT INSECTS,
Murray State Univ., Ky.
M. E. Sisk.
J Tenn Acad Sci. 49(3), p 105-106, 1974.

Descriptors: *Insects, *Nets.
Identifiers: *Collecting technique, *Stream drift nets.

A method is described for using stream drift nets in collecting small adult insects in flowing water.--Copyright 1975, Biological Abstracts, Inc.
W76-08574

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
For primary bibliographic entry see Field 2D.
W76-08585

MEASUREMENT OF SOIL MOISTURE IN POONA BLACK COTTON SOIL USING AN INFRA-RED MOISTURE BALANCE,
Meteorological Office, Poona (India).
For primary bibliographic entry see Field 2G.
W76-08734

7C. Evaluation, Processing and Publication

ESTIMATION BY DIGITAL COMPUTER OF THE DRAWDOWN CAUSED BY GROUNDWATER WITHDRAWAL,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4B.
W76-08140

EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES,
National Environmental Satellite Service, Washington, D.C.
D. R. Wiesnet, D. F. McGinnis, and M. C. McMillan.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-21771, $5.00 in paper copy, $2.25 in microfiche. Goddard Space Flight Center ID No. C0313, November 30, 1974. 91 p, 56 fig, 7 tab, 48 ref. NASA 432-641-14-04-03.

Descriptors: *Satellites(Artificial), *Data collections, *Remote sensing, *Hydrologic data, Limnology, Hydrology, Runoff, Snow, Snowmelt, Lake ice, Ice, Currents(Water), Lakes, Soil moisture.

Identifiers: Snow-extent mapping, Lake currents, Flood mapping.

The Earth Resources Technology Satellite-1 (ERTS-1) with Multispectral Scanner Subsystem (MSS) data have been used in a variety of hydrologic research including snow-extent mapping; studies of snowmelt, snowmelt-runoff, spectral reflectance of snow for assessing snowpack conditions, and snow albedo; lake ice formation, breakup, and migration; lake current measurements; multispectral studies of lake ice; and flood studies. MSS sensing of soil moisture over a well-vegetated test site was unsuccessfully attempted. Although a powerful research tool, ERTS-1 has very limited use as an operational system for the hydrologic community because of its 18-day revisit cycle and its lack of a 'quick-look' capability. (Morris-ISWS)
W76-08147

ERTS-1 INVESTIGATION OF WETLANDS ECOLOGY,
American Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W76-08319

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY, PART II: NON-CONSERVATIVE SPECIES TRANSPORT MODELS,
Alabama Univ., Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 5B.
W76-08327

DEVELOPMENT OF A THREE-DIMENSIONAL TIME-DEPENDENT FLOW FIELD MODEL,
Louisiana State Univ., Baton Rouge, Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2L.
W76-08328

THE ESTIMATION OF LOCAL RAINFALL BY SAMPLE GAUGING,
For primary bibliographic entry see Field 2B.
W76-08348

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, UNIT 2, SAN BENITO, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08376

FLOOD PLAIN INFORMATION: ALAMO AND ULATIS CREEKS, VACAVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08377

FLOOD PLAIN INFORMATION: EEL RIVER--STAFFORD TO HOLMES, HUMBOLDT COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08378

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, PACHECO CREEK, SAN BENITO COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08379

FLOOD PLAIN INFORMATION: SAN ANTONIO CREEK AND TRIBUTARIES, VICINITY OF OJAI, VENTURA COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08380

FLOOD PLAIN INFORMATION: PURGATOIRE RIVER AND TRIBUTARIES, VICINITY OF TRINIDAD, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-08381

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND TRIBUTARIES, GREAT BEND, KANSAS, TO JOHN MARTIN DAM, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-08388

FLOOD PLAIN INFORMATION: SALINE RIVER AND TRIBUTARIES, BENTON, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W76-08389

FLOOD PLAIN INFORMATION: COLORADO RIVER AND RIFLE, GOVERNMENT, HUBBARD GULCH CREEKS, RIFLE, COLORADO.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08390

MEASUREMENTS OF CURRENT FLOW DURING SUMMER IN LAKE HURON,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2H.
W76-08413

APPLICATION OF THE NATIONAL WEATHER SERVICE FLASH-FLOOD PROGRAM IN THE WESTERN REGION,
National Weather Service Salt Lake City, Utah. Western Region.
For primary bibliographic entry see Field 4A.
W76-08415

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y. Water Information Center, Incorporated, Port Washington, New York, 1975. 568 p. Compiled and edited by Fritz van der Leeden.

Descriptors: *Statistics, *Water resources, *Water supply, *Data collections, Precipitation(Atmospheric), Runoff, Withdrawal, Discharge(Water), Rivers, Reservoirs, Dams, Hydroelectric power, Groundwater, Surface waters, Municipal water, Water utilization, Water demand, Industrial water, Water pollution, Thermal water, Glaciers, Irrigation.
Identifiers: *World-wide statistics.

Because information on water availability and water use is of key importance for sound water planning and water management, these water statistics have been selected for handy reference to hydrologists, engineers, planners, developers, managers, and others. Every effort has been made to include, as far as possible, uniform data on streamflow and runoff, water demand and water use for public supply, irrigation, industry and power generation. Miscellaneous factual data of interest are also included. The tables represented reflect the nature and type of statistics available. On a world wide basis, information on streamflow proved to be fairly complete, but data on the use of water resources were found to be inadequate. A significant start has been made in putting together essential worldwide water statistics. Further editions will show an improved and broadened worldwide coverage as more material is published and cooperative efforts among nations increase. A detailed index has been provided. Statistical data are frequently found on more than one table and some overlapping material and occasional discrepancies in specific data will be noticed. In each case, however, the origin and date of the material are clearly identified on the table and in the bibliography that follows each continental section. (Sims-ISWS)
W76-08507

A RECONSIDERATION OF THE FIERING TWO-STATION MODEL,
Birmingham Univ. (England). Dept. of Mathematical Statistics.
For primary bibliographic entry see Field 4A.
W76-08519

DYNAMIC RESPONSE OF AQUIFER SYSTEMS TO LOCALIZED RECHARGE,
Chile Univ., Santiago. Centro de Recursos Hidraulicos.
For primary bibliographic entry see Field 2F.
W76-08520

ANALYSIS OF ERTS-1 IMAGERY OF WYOMING AND ITS APPLICATION TO EVALUATION OF WYOMING'S NATURAL RESOURCES,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W76-08535

UTILIZATION OF ERTS-1 DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4A.
W76-08538

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 2: NORTHERN GREAT BASIN AND CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif.
Data Report, 1974. 509 p, 18 fig, 1 tab, 3 ref.

Descriptors: *Water resources, *Surface waters, *Basic data collections, *Water yield, *California, Streamflow, Flow rates, Gaging stations, Reservoirs, Lakes, Elevation, Crest-stage gages.

Surface-water records for the 1974 water year for California include records of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites. Records for a few pertinent gaging stations in bordering states also are included. The records were collected and computed by the Water Resources Division of the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W76-08556

SELECTED HYDROLOGIC DATA, CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
L. J. McGreevy, and R. A. Sloto.
Open-file report, January 1976. 138 p, 2 fig, 1 plate, 7 tab, 2 ref.

Descriptors: *Groundwater resources, *Well data, *Chemical analysis, *Basic data collections, *Pennsylvania, Water levels, Aquifers, Hydrologic data, Maps, Hydrographs, Water quality.
Identifiers: *Chester County(Pa).

This report presents selected hydrologic data collected during a study of the groundwater resources of Chester County, Pennsylvania. The study was made during 1973-76 by the U. S. Geological Sur-

vey in cooperation with the Chester County Water Resources Authority. Tables include water levels, chemical analysis, and well data. (Woodard-USGS)
W76-08557

DATA ON SELECTED LAKES IN WASHINGTON, PART 3,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08564

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 3. KITSAP, MASON, AND PIERCE COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08565

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 4. CLARK, COWLITZ, GRAYS HARBOR, LEWIS, PACIFIC, SKAMANIA, AND THURSTON COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08566

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 5. CHELAN, FERRY, KITTITAS, KLICKITAT, OKANOGAN, AND YAKIMA COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08567

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN BRAZORIA, FORT BEND, AND WALLER COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08569

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1970-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08570

SAVANNAH RIVER BIOLOGICAL SURVEY.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08594

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 2B.
W76-08694

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ. Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-08730

IMPLEMENTATION OF HYDROLOGIC MODELS AT GODDARD SPACE FLIGHT CENTER.
IBM Space Systems Center, Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W76-08745

COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W76-08746

8. ENGINEERING WORKS

8A. Structures

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, GENERAL REPORT, VOLUME I,
Wahler (W. A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-08143

NONLINEAR EARTHQUAKE RESPONSE OF CONCRETE GRAVITY DAMS,
California Univ., Berkeley. Earthquake Engineering Research Center.
For primary bibliographic entry see Field 8F.
W76-08426

SOME THEORETICAL CONSIDERATIONS IN RESERVOIR DESIGN,
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 8B.
W76-08518

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1974,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2J.
W76-08559

FIELD PERFORMANCE OF PERMEABLE BREAKWATER,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
J. C. Ludwick, P. Fleischer, R. E. Johnson, and G. L. Shideler.
Proceedings of the American Society of Civil Engineers, Journal of the Waterways, Harbors and Coastal Engineering Division, Vol. 101, No.4, p. 357-368, 1975. 5 fig., 4 tab., 3 ref.

Descriptors: *Breakwaters, *Coastal structures, Ocean waves, *Shore protection, Virginia, Beach erosion, Sand bars, Currents(Water), Shoals, Waves(Water), On-site tests.
Identifiers: *Virginia Beach(Va).

An open-work steel breakwater was installed at Virginia Beach, Virginia, in 1973 to control beach erosion. The submerged structure, adjacent surf zone, and beach were monitored. Wave heights and longshore current speed in its lee were not diminished. No wave shadow zone was produced. It had no effect on average beach width, but there was an indication of a shoreline bulge. There was no evidence that smaller sand particles rested in its lee preferentially. An offshore bar moved 185 feet inshore and remained there. Shoaling in its lee was greater than in nearby areas. Most of the incident wave energy appeared to pass over or through the structure onto the beach. Reduction in wave action was too small to permit appreciable sand accumulation from longshore currents in its lee. Installation in shallower water nearer shore would cause more dissipation and reflection of wave energy, but would place the structure at the plunge point of some waves, necessitating increased structural strength; and might pose hazards to bathers. Reduction in wave energy required/vertical foot of sand accretion cannot be accurately calculated for a given beach at present. More knowledge is needed regarding accurate design and placement. (Buchanan-Davidson--Wisconsin)
W76-08684

8B. Hydraulics

HYDRAULIC MODEL VORTEX STUDY-GRAND COULEE THIRD POWERPLANT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
E. R. Zeigler.
Report REC-ERC-76-2, February 1976. 31 p, 35 fig, 8 ref.

Descriptors: *Vortices, Eddies, Hydraulic similitude, *Hydraulic models, *Model studies, Forebays, Hydraulic structures, Trashracks, Fluid flow, Washington, Columbia River.
Identifiers: Grand Coulee Third Powerplant(Wash).

Hydraulic model studies of the Grand Coulee Third Powerplant forebay indicated detailed vortex study should be made. Vortex modeling is difficult because of lack of similitude between model and prototype. A literature search disclosed an Equal Velocity Method of vortex modeling and this method was used in this study. Without model trashracks, air-entraining vortices readily formed and with model trashracks vortex action was reduced. Rafts either floating or submerged, suppressed vortex formation. Investigations were made to determine the prototype area in the forebay that may be susceptible to vortex action and need raft protection. (Bureau of Reclamation)
W76-08113

STABILITY AND MIXING OF A VERTICAL ROUND BUOYANT JET IN SHALLOW WATER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
J. H. Lee, G. H. Jirka, and D. R. F. Harleman.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-242 934, $6.00 in paper copy, $2.25 in microfiche. M.I.T. Energy Laboratory Report No. MIT-EL 74-014, November 1974. 135 p, 29 fig, 2 tab, 12 ref, 6 append.

Descriptors: *Thermal pollution, *Heat flow, *Hydrodynamics, *Submergence, *Stability, Froude number, Jets, Laboratory tests, Shallow water, Analytical techniques, Computer programs.
Identifiers: *Buoyant jet, Waste heat disposal.

Discharging heated water through submerged vertical round ports located at the bottom of a receiving water body is a currently used method of waste disposal. The prediction of the temperature reduction in the near field of the buoyant jet is a problem of environmental concern. The mechanics of a vertical axisymmetric buoyant jet in shallow water was theoretically and experimentally investigated. Four flow regimes with distinct hydrodynamic properties were discerned in the vicinity of the jet: the buoyant jet region, the surface impingement region, the internal hydraulic jump, and the stratified counterflow region. An analytical framework was formulated for each region. The coupling of the solutions of the four regions yielded a prediction of the near field stability as well as the temperature reduction of the buoyant discharge. It was found that the near field of the buoyant jet is stable only for a range of jet densimetric Froude numbers and submergences. A theoretical solution was given for the stability criterion and the dilution of an unstable buoyant jet. A series of experiments were conducted to verify the theory. The experimental results were compared to the theoretical predictions, and good agreement was obtained. (Singh - ISWS)
W76-08144

INTAKE MANIFOLDS AND EMPTYING VALVES FOR LOWER MONUMENTAL LOCK, SNAKE RIVER, WASHINGTON,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8C.
W76-08146

DENSE EFFLUENT DISPERSION IN A STREAM,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W76-08316

MOMENTUM TRANSFER IN HYDRODYNAMICALLY DEVELOPING LAMINAR FLOW IN A STRAIGHT CHANNEL,
Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
C. W. Savery, and M. S. Bhatti.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 316, $5.00 in paper copy, $2.25 in microfiche. Report DREX/MEM-75-12, February 1975. 81 p, 9 fig, 8 tab, 19 ref, 3 append. NSF ENG73-08125 A01.

Descriptors: *Model studies, *Laminar flow, *Channel flow, *Momentum transfer, Mathematical models, Analytical techniques, Hydrodynamics, Fluid mechanics, Flow, Viscous flow, Boundary layers, Mathematics, Computer programs, Mathematical studies, Hydraulics.

The non-linear momentum boundary layer equation was solved exactly by the technique of equation splitting. The relations between boundary layer thickness and pressure drop with core velocity were determined by applying continuity of mass across the channel. The mechanical energy equation then gave the variation of core velocity along the channel. Closed form, dimensionless expressions were obtained for all momentum transfer quantities. This analysis resulted in a fully developed, incremental pressure defect of K sub infinity = 0.5969 and an entrance length of (Xi/a) = (0.1674) Re. Predicted axial pressure drops fall within 3% of data measured by Sparrow and coworkers. Theoretical predictions of the local friction coefficient were also in good agreement with the data of Hahnemann and Ehret taken along a rectangular channel. (Sims-ISWS)
W76-08318

EXAMINATION OF THE CONCEPT AND USE OF THE STANDARD PROJECT FLOOD,
Meta Systems, Inc., Cambridge, Mass.
M. Fiering.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 190, $7.75 in paper copy, $2.25 in microfiche. Final Report, August 1974. 176 p, 23 fig, 9 tab.

Descriptors: *Design flood, *Design standards, *Design storm, *Connecticut River, *Flood control, Flood protection, Dams, Dam design, Flood recurrence interval, Probability, Statistical methods, Climatology, Probable maximum precipitation, Precipitation(Atmospheric), Hydrographs, Unit hydrographs, Rainfall disposition, Watersheds(Basins).

An attempt was made to explain traditional procedures used by the Corps of Engineers to evaluate and design flood management structures in the Connecticut River basin, focusing on the 'Standard Project Flood.' While the Corps does not intend the Standard Project Flood to be an absolute standard of performance, it was shown that this concept has developed its own momentum and its own personality over the years, as if it had some special sanctity. The report attacked this special sanctity. It was argued that economic considerations, or risk aversion, surreptitiously introduced into traditional design criteria, should be made to surface through more appropriate techniques, specifically through 'Bayesian' sensitivity analysis of the extent to which the planning process impacts the economic system it is designed to serve. (Sims-ISWS)
W76-08321

DEVELOPMENT OF A THREE-DIMENSIONAL TIME-DEPENDENT FLOW FIELD MODEL,
Louisiana State Univ., Baton Rouge, Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2L.
W76-08328

NUMERICAL COMPUTATION OF TWO-DIMENSIONAL FLOWS,
Lanchester Polytechnic, Coventry (England), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-08341

OREGON COAST SHORELINE CHANGES DUE TO JETTIES,
Oregon State Univ., Corvallis. School of Oceanography.
P. D. Komar, J. R. Lizarraga-Areiniega, and T. A. Terich.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW1, Proceedings Paper 11933, p 13-30, February 1976. 14 fig, 16 ref.

Descriptors: *Coastal engineering, *Beaches, *Littoral drift, *Erosion, *Jetties, *Oregon, Sedimentation, Computer models, Bays, Shores, Sand spits.
Identifiers: Tillamook Bay(Ore), Siuslaw River(Ore).

Patterns of beach erosion and accretion due to jetty consruction are examined for the Oregon coast, which has a seasonally reversing littoral drift with a zero or near-zero net drift as indicated by the geomorphic and sedimentological evidence. Shoreline accretion took place adjacent to the jetty, both north and south, filling the embayments formed between the jetties and the prejetty shoreline. The amount of accretion depended on the size of the embayment created. Sand for this accretion was supplied by beach erosion at greater distances from the jetties. In the case of the jetties at Tillamook Bay, the erosion was sufficiently severe to breach Bayocean Spit. A computer model was developed to simulate shoreline changes that occurred between construction of the Siuslaw River jetties. The model demonstrated deposition next to the jetty and erosion at greater distances, showing good agreement with the actual shoreline changes. (Singh - ISWS)
W76-08342

DIMENSIONLESS SOLUTION OF DAM-BREAK FLOOD WAVES,
Patras Univ. (Greece). School of Civil Engineering.
J. G. Sakkas, and T. Strelkoff.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11910, p 171-184, February 1976. 8 fig, 9 ref, 2 append.

Descriptors: *Flood waves, *Dams, *Floods, Floodwater, Graphical methods, Hydraulics, *Mathematical models, Open channel flow, Open channels, Rivers, Streams, Unsteady flow, Waves(Water), Numerical analysis, Dam failure.
Identifiers: *Computation, Wave propagations.

A mathematical model was presented for the prediction of flood wave resulting from the instantaneous and complete failure of a dam and subsequent emptying of the reservoir into a prismatic dry channel having a parabolic cross section of arbitrary degree. It consisted of the numerical integration of the characteristic equations over the irregular grid of characteristic lines using a predictor-corrector scheme. The solution was advanced towards the wave front by a gradual refinement of the characteristics net. Over a very short region comprising the wave tip, the solution was extended to the wave front, characterized by zero depth, using a simplified form of the momentum equation resulting from physical considerations in the tip region. Computed results were compared with experimental data obtained by others. Corroboration by the experimental results was considered adequate. Dimensionless graphs of practically important flood characteristics were prepared for a wide range of channel shape, size, slope and roughness, and dam height. (Lee - ISWS)
W76-08343

SIMULATION OF HYDRAULIC PROCESSES IN OPEN CHANNELS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
C-L. Chiu, H-C. Lin, and K. Mizumura.
Journal of Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11905, p 185-206, February 1976. 13 fig, 7 ref.

Descriptors: *Channels, *Dispersion, Flow, Monte Carlo method, Fluid friction, Roughness(Hydraulic), Sediments, *Simulation analysis, Stochastic processes, Unsteady flow, Model studies, Channel flow, Mannings equation, Hydraulics, Velocity, Steady flow, Open channel flow.
Identifiers: *Secondary flow, *Stochastic models.

Techniques combining the deterministic and stochastic methods have been developed to compute and simulate various hydraulic processes in open channels, such as the three-dimensional distribution of flow velocity, steady and unsteady flows, flow resistance, secondary currents, and unsteady dispersion. The deterministic approach, using a curvilinear coordinate system based on the velocity distribution of flow, was used to deal with the basic hydrodynamic part of analysis. The stochastic approach was used to treat the irregular channel geometry that tends to cause uncertainties in simulated hydraulic processes in open channels. The techniques can be used to simulate the three-dimensional velocity distribution of (primary) flow, unsteady dispersion, and sediment transport, secondary currents, steady and unsteady flows, and flow resistance (Manning's n). In computing an unsteady flow it was found that the use of mean cross sections, without the geometrical irregularity of channel, causes errors in the peak and recession part of computed hydrographs, although it has the advantages of being simple and insensitive to uncertain Manning's n. (Lee - ISWS)
W76-08344

THERMAL-HYDRAULIC MODEL STUDY OF OFFSHORE DISCHARGE SYSTEM FOR KAHE POWER PLANT, HAWAII,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-08508

CHANNEL FLOW OVER PERMEABLE BEDS OF GRADED SPHERES,
Humphreys (Howard) and Sons, Reading (England).
A. F. E. Zagni, and K. V. H. Smith.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11892, p 207-222, February 1976. 9 fig, 17 ref, 2 append.

Descriptors: *Boundary processes, *Pervious soils, *Flow resistance, *Hydraulics, *Permeability, Laboratory tests, Flow, Channels, Seepage, Reynolds number, Beds, Roughness(Hydraulic).

Identifiers: *Rugosity, Slip velocity, Shear flow.

Tests were carried out to determine the velocity distribution and the hydraulic roughness in flows over 20 permeable beds made up of different sizes and gradings of spherical particles. Permeable beds were made by using lead shot or steel balls to keep the channel beds flat for a wide range of Reynolds numbers. The surface rugosity and the permeability of these beds were determined. The results showed that in flow over a permeable bed, the virtual zero of the main channel velocity profile is depressed below the bed surface or interface, resulting in finite slip velocity. Energy losses resulting from the shear flow in the bed cause the overall friction loss for a flow over a permeable bed to be greater than that for a flow over an equivalent impermeable bed. There was strong correlation between the hydraulic roughness of permeable beds and a simple parameter which included both a characteristic particle size of the bed material, and the permeability. (Singh-ISWS)
W76-08511

SOME THEORETICAL CONSIDERATIONS IN RESERVOIR DESIGN,
Bechtel Corp., San Francisco, Calif.
S. C. Mehrotra.
Journal of Hydrology, Vol. 29, No. 1/2, p 115-120, March 1976. 1 fig, 2 ref.

Descriptors: *Reservoir design, *Theoretical analysis, *Droughts, Rainfall, Probability, Mathematical studies, Cooling water, Synthetic hydrology, Reservoirs, Water storage.
Identifiers: *Theoretical considerations, *Drought duration, *Unit time distribution, Storage equation.

The concept of a critical duration of a drought of given probability of occurrence was discussed. It was also shown that the unit time distribution of a drought of a given duration and a probability of occurrence obtained first by Stall (1962) represented a sequence of events which had a lower probability of occurrence than that of a postulated event. A rigorous mathematical formulation for finding the unit time distribution was presented. (Roberts-ISWS)
W76-08518

INVESTIGATION OF ROADWAY DRAINAGE AS RELATED TO THE PERFORMANCE OF FLEXIBLE PAVEMENTS,
South Carolina Univ., Columbia, Coll. of Engineering.
T. Y. Chu, and W. K. Humphries.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-239 499, $5.00 in paper copy, $2.25 in microfiche. Final Report, August 1974. 77 p, 7 fig, 5 tab, 8 ref, 1 append.

Descriptors: *Drainage, *Roads, *Paving, Highways, Drainage engineering, Drainage systems, Seepage, Groundwater, Subsurface waters, Subsurface drainage, Tile drainage, Pipes, Tiles, Drainage practices, Gravels, Aggregates, Pervious soils, Engineering, Road construction.
Identifiers: *Flexible pavements.

The primary objectives of this study were to evaluate current practices and to investigate various alternatives for providing subsurface drainage facilities for highways in South Carolina. To this end, a survey of current design and construction practices and field investigations of subsurface drainage facilities for highways with flexible pavements were conducted. Presented in this report were findings from this study as well as discussions and recommendations in regard to the planning, design, construction, and maintenance of subsurface drainage systems. Topics concerning pavement transverse subsurface drainage, the interception of longitudinal flow of water below the pavement surface, groundwater control, and filter materials were included. (Sims-ISWS)
W76-08534

GRAPHIC DETERMINATION OF SUB-MAIN PIPE SIZE FOR SOLID-SET SPRINKLER IRRIGATION ON STEEP, NON-UNIFORM SLOPES,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-08682

PRELIMINARY HYDROLOGIC DESIGN OF SMALL FLOOD DETENTION RESERVOIRS,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
R. L. Wycoff, and U. P. Singh.
Water Resources Bulletin, Vol. 12, No. 2, p 337-349, April 1976. 5 fig, 3 tab, 4 ref.

Descriptors: *Flood routing, *Hydrologic budget, *Reservoir design, Water resources, Design, Reservoirs, Numerical analysis, Hydrology, Floods, Storage, Hydrographs, Discharge(Water), Inflow, Model studies, Detention reservoirs, Reservoir storage.
Identifiers: *Flood detention, *Hydrologic design, *Flood storage, Model verification.

A method was presented by which the volume of flood storage required for a single reservoir or a series of reservoirs could be estimated without using numeric flood-routing techniques. The procedure requires a minimum of computations and is most applicable to preliminary design situations where a high degree of accuracy is not required. In the idealized case, a watershed and reservoir system were considered where both the inflow and outflow hydrographs were triangular in shape. By using a triangular hydrograph the volume of runoff entering the reservoir was determined. By continuity, the total volume of runoff was determined by the reservoir outflow triangular hydrograph. The maximum storage volume utilized during the passage of the flood wave through the reservoir was equal to the area difference between inflow and outflow hydrographs expressed in a simple equation. In a more generalized case, where the hydrographs were curvilinear in shape, a constant and two exponents were derived empirically to fit by linear regression an equation to estimate storage required to obtain a desired outflow rate given an inflow hydrograph. Since many factors affect this relationship, the method should be considered an estimating guide. (Roberts-ISWS)
W76-08731

SUPPRESSION OF WAVES IN SLOTTED-WALLED CHANNEL,
Trinity Coll., Cambridge (England).
A. M. Binnie.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 12006, p 397-409, March 1976. 5 fig, 2 tab, 6 ref, 4 append.

Descriptors: *Model studies, *Open channel flow, *Flow characteristics, Hydraulic models, Flow, Channel flow, *Flow around objects, Waves(Water), Equipment, Hydraulics, Hydrodynamics.
Identifiers: *Wave suppression, Slots, Discontinuities.

For the study of flow past immersed objects, a channel with slotted sides and bottom and surrounded by an open chamber has advantages over the usual solid-walled channel. Previous experience has shown that the stream can be disturbed by self-induced oscillations. Experiments were described which demonstrate that the waves in the channel move upstream in synchronism with longitudinal stationary waves in the outer chamber. An approximate theory of this effect was derived. The trouble can be avoided by making the outer chamber only slightly deeper than the channel. The flow may be disturbed by self-induced oscillations. The waves were shown to move upstream in synchronism with stationary waves in the outer chamber. They can be eliminated by making the depths in the channel and the outer chamber nearly the same. (Sims-ISWS)
W76-08742

DISSIPATION OF TURBULENT ENERGY IN A NATURAL CHANNEL,
Gidrometeorologicheskii Institut, Odessa (USSR).
D. I. Grinval'd, and M. I. Zheleznyak.
Available from the National Technical Information Service, Springfield, Va 22161 as N75 17613, $3.50 in paper copy, $2.25 in microfiche. Technical Translation NRC/CNR TT-1782, Canada Institute for Scientific and Technical Information, 1974. 11 p, 3 fig, 2 tab, 7 ref. Translated from Meteorologiya i Gidrologiya, Vol 13, No 7, p 50-55, 1971.

Descriptors: *Rivers, *Turbulence, *Energy dissipation, Channels, Channel flow, Streamflow, Flow, On-site investigations, Measurement, Data processing, Analytical techniques, Fluid mechanics, Hydraulics.
Identifiers: Kolmogorov-Obukhov theory.

An effort was made to apply the Kolmogorov-Obukhov theory of locally isotropic turbulence to the study of turbulence in natural rivers. The inertial subrange was indicated and the limits were determined within which the 2/3 and -5/3 laws are fulfilled. Empirical time structural, correlative and spectral functions of the longitudinal velocity component were computed. For the first time the velocities of energy dissipation for natural streams were calculated directly from those functions. (Sims-ISWS)
W76-08744

EXIT OF GROUND WATERS ON DRAINAGE BOUNDARIES,
Ebasco Services Inc., New York.
For primary bibliographic entry see Field 2F.
W76-08750

8C. Hydraulic Machinery

RESEARCH AND DEVELOPMENT OF AN AIRBORNE HYGROSCOPIC SPRAY SYSTEM,
Mee Industries, Inc., Rosemead, Calif.
For primary bibliographic entry see Field 3B.
W76-08111

LOAD AND VOLTAGE CONTROL ALGORITHMS FOR GRAND COULEE POWERPLANT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
W. B. Gish.
Report REC-EKC-76-3, March 1976. 87 p, 35 fig, 1 tab.

Descriptors: *Supervisory control(Power), *Algorithms, Automatic control, Control systems, Computer programs, Mathematical models, Governor, Data transmission, Power system operation, Peak power, Hydroelectric power, Electric generators, Generator, Load distribution, Grand Coulee Dam, Columbia River.
Identifiers: Minicomputers, Columbia Basin project(Wash).

A load and voltage controller for managing the power output of 26 generators and the bus voltages for three high-voltage busses at the Grand Coulee Power Complex is described in detailed flow chart form. The controller is designed for inclusion in a computer-based supervisory control system. The load control is based on a closed-loop digital power controller developed especially for

hydroelectric installations. Also included is a unique twollevel load allocation system utilizing lod-frequency commands from an area automatic generation controller and features an alternating reactive-power balance and voltage setpoint algorithm. The load and voltage controllers use direct analog signals to the electrohydraulic governors and the thyristor-based excitation systems. (Bureau of Reclamation)
W76-08112

HYDRAULIC MODEL VORTEX STUDY-GRAND COULEE THIRD POWERPLANT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W76-08113

INTAKE MANIFOLDS AND EMPTYING VALVES FOR LOWER MONUMENTAL LOCK, SNAKE RIVER, WASHINGTON,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
L. Z. Perkins, and H. P. Theus.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A011 396, $4.50 in paper copy, $2.25 in microfiche. Technical Report No. 105-1, May 1975. 58 p, 26 fig, 13 tab.

Descriptors: *Hydraulic models, *Model studies, *Hydraulic similitude, *Laboratory tests, Flow, Hydraulic equipment, Gate control, Intake gates, Vortices, Intakes.
Identifiers: *Flow conditions, *Monumental Dam(Wash), *Lock chamber hydraulics, Tainter emptying valve, Hydraulic loads.

Flow conditions at proposed intakes and performance of a conventional tainter emptying valve for the navigation lock at Lower Monumental Dam were studied in a 1:25-scale model. Vortexes occurred over the land wall intake on original design during a portion of the filling operation; eddies along the river wall dissipated before a vortex could form. With the adopted intake, vortexes were absent during tests with steady flow into the lock chamber. Dimples that would indicate incipient vortexes in the model were not evident during filling operations at an initial head of 117 ft (maximum lock inflow increased 10%) when two adjacent spillway bays were closed, when both intakes were open, or when the river wall intake was closed. Intermittent dimples formed when the spillway flow averaged 10,000 cfs per bay and when the land wall intake was closed. Performance of a conventional tainter emptying valve was satisfactory. Negative pressures at the bottom corner of the trunnion support were minor; pressure surges and hydraulic loads on the valve were small. (Morris-ISWS)
W76-08146

FAN DISTURBING SAND AT THE BOTTOM OF A BODY OF WATER SO THAT IT MAY BE PUMPED UP EFFICIENTLY,
T. Araoka.
U. S. Patent No. 3,945,761, 2 p, 12 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1855, March 23, 1976.

Descriptors: *Patents, *Bodies of water, Underwater, Hydraulic equipment, Hydraulic mining, Sands.
Identifiers: Fans.

The invention relates to a fan for hydraulically disturbing sand which is to be pumped up by sand pumps from the bottom of a body of water. The fan is comprised of a central supporting member having a frusto-conical outer surface which is larger at its upper than its lower end. A number of vanes are attached along their inner edges to the outer surface. The vanes are circumferentially distributed about the supporting member and extend for a uniform distance from the frustoconical surface throughout their lengths. The lower part of each vane is substantially straight while its upper part is curved toward the direction of rotation of the fan. (Sinha - OEIS)
W76-08205

PUMPS FREE CITY FROM LAKE ERIE FLOODING.
The American City, Vol. 88, No. 9, p 116-117, September, 1973. 2 fig.

Descriptors: *Drainage system, *Pumps, *Storm runoff, Construction, Sewers, Floods, Overflows, Lake Erie.
Identifiers: Luna Pier(Mich), Catch basins.

A new drainage system in the low lying sections of Luna Pier, Michigan, is partially completed resulting in storm overflow disappearance within two hours. The key to the new system is a pair of single-pit pumping stations. Each contains two Flygt submersible pumps rated at 2500 gpm per unit. Pump controls, mounted in a weather-tight panel above ground at each station, are programmed to operate the pumps on alternate cycles. Liquid level sensors control pump operation. The cross-section of street pavements has been modified in those areas subject to flooding so that they are constructed with a valley or swale in the center. This permits the use of only one catch basin at each intersection (instead of four) and only one sewer line running along the center of the street. (Sandoski-FIRL)
W76-08250

'WE'VE FOUND A REAL TIME-SAVER',
Mansfield Sewage Treatment Plant, Ohio.
D. Covant.
Water and Wastes Engineering, Vol. 10, No. 10, p 44, October, 1973. 1 fig.

Descriptors: *Maintenance, *Pumps, Pumping, Sewage, Equipment, Joints(Connections), Ohio, Waste water treatment.
Identifiers: Couplings.

A new slide-away sewage pump coupling has reduced periodic maintenance check downtime at the Mansfield, Ohio, Sewage Treatment Plant from several hours to about thirty minutes. The time saving is due to the combination of stationary and movable coupling faces that can be disconnected in minutes as opposed to hours in conventional sewage ejector installations. The Peabody Barnes coupling automatically guides the pump into operating position when it is lowered into the pit. With this new installation, using a one-ton block and tackle, a two-man maintenance team can lift the pump, clean it, and drop it back into position; it is no longer necessary to drain the pit or unbolt the pump from its connections. (Sandoski-FIRL)
W76-08251

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS SEA WATER DESALTING PLANTS, DESIGN OF 1-10 MGD SEAWATER PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08284

OCEAN THERMAL ENERGY CONVERSION.
Energy Digest, Vol. 4, No. 5, p. 4-14, 1975. 9 fig.

Descriptors: *Oceans, *Electric power, *Solar radiation, Design data, Tropical regions, Electric power plants, *Energy conversion.

An ocean thermal energy conversion system (OTEC) to generate electric power, designed for siting in tropical regions up to 80 miles offshore, is described. The baseline power plant configuration consists of four power-generating modules attached to a semi-submersible spar-type platform and provides bouyancy for the entire system. The vertically oriented platform offers the advantages of excellent stability, adaptability to a modular concept, simplicity of cold-water pipe deployment, ease of separating different-temperature effluents, virtual invulnerability to damage by surface vessels, is capable of surviving hurricane conditions, and is constructed of materials and processes currently well known to industry, promising a 100-year life of continuous operation. It offers an alternative to transmitting energy from the OTEC plant to the consumer by the option to bring the power-consuming process to the plant thus industrial processes that may be hazardous or polluting ashore, or that compete for critical land uses, may be feasible afloat. A demonstration is projected in 1981, and on-line four-module plant in 1986, and the availability of 1000 MWe by the end of 1900. Construction and deployment of successive plants are possible at a rate of one per year following the first delivery in 1987, each with a projected power output of 186 MWe net. (Auen-Wisconsin)
W76-08366

FIELD EVALUATION TESTING OF REVERSE OSMOSIS HIGH PRESSURE PUMPS AND ENERGY RECOVERY TURBINES.
Catalytic, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 3A.
W76-08372

WATER FILTER ASSEMBLY,
H. D. Lipner.
U. S. Patent No. 3,935,106, 5 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1875, January 27, 1976.

Descriptors: *Patents, *Water treatment, *Water quality control, *Water pollution treatment, *Filtration, *Filters, Valves, Safety.

The water filter assembly described eliminates the necessity for using two separate valves, one to shut off the stream of water entering the filter and the other to prevent back flow of water from the water line. Both of these functions are accomplished in one simple rotational operation by the use of a single valve assembly. The filter element may be easily and quickly changed with only a partial rotation of a valve rotor within its housing. A reciprocal rotation of the valve rotor again opens the filter to the incoming and outgoing streams of water. The invention also provides for a safety feature which when the rotor is rotated from its filtering position, permits the stream of water from the community line to bypass the filter element, should the filter tank become damaged or otherwise become inoperative. An atomatic vacuum relief mechanism releases the vacuum occuring within the filter tank when the rotor is placed in bypass position. (Sinha-OEIS)
W76-08392

APPARATUS FOR PUMPING OIL-WATER MIXTURE FROM A COLLECTION VESSEL OF A FLOATING OIL COLLECTOR INTO SETTLING TANKS,
For primary bibliographic entry see Field 5G.
W76-08403

DESALTING HANDBOOK FOR PLANNERS.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 3A.
W76-08584

USE OF SURFACE-ACTIVE CHEMICALS IN PUMP-ASHORE SCHEMES AND SUCTION DREDGERS,
Atomic Energy Research Establishment, Harwell (England).
P. Biddle, and J. H. Miles.
Available from the National Technical Information Service, Springfield, Va 22161 as AERE-R-6816-Rev, $4.50 in paper copy, $2.25 in microfiche. Report AERE - R 6816 (Revised), January 1975. 61 p, 14 tab, 30 fig, 2 append.

Descriptors: *Surfactants, *Dredging, *Silts, Sands, Mud, Marl, Chemical precipitation, Cores, Laboratory tests, Bearing strength, Flocculation, Dewatering, Waste water treatment.
Identifiers: *Surface-acting agents, *Suction dredges, *Pilot-scale tests, Polyacrylamide flocculant, *Mud suspensions, Port dredging operations, Sodium carboxymethyl cellulose.

Surface-active agents added to mud or silt accelerate dewatering and consolidation. Laboratory tests and pilot-scale trials were carried out using mainly Thames 'black mud' combined with either a flocculating agent (polyacrylamide PAM) or a protective colloid (sodium Carboxymethyl cellulose (SCMC). Measurements were made of settling rates, packing densities, rate of loss of water, and increase in bearing strength of mud beds. The effects of salinity, origin of mud or silt, ionic character of PAM, and variation in mud concentration on settling rates have been determined. There are discrepancies between this work and some later results which had not been cleared up, but may have been due to differences in the mud samples used. It was found that while SCMC had little effect, PAM accelerated dewatering and consolidation in the early stages. For application to pump ashore schemes the consolidation will need to be studied on a large scale over a much longer period (years). In suction dredging the benefit would be in increasing the payload by increasing the density of spoil in the dredger, but flocculant requirements are high in concentrated mud suspensions, and the figures in this work suggest that it was not economic. (Roberts-ISWS)
W76-08747

8D. Soil Mechanics

DERIVATION OF A MODEL RAIN FOR THE DIMENSIONING OF SEWER SYSTEMS (ENTWICKLUNG EINES BERECHNUNGSREGENS FUER DIE BEMESSUNG VON KANALNETZEN),
For primary bibliographic entry see Field 5D.
W76-08253

PORE SIZE DISTRIBUTION OF COMPACTED SOILS AFTER CRITICAL REGION DRYING,
Purdue Univ., Lafayette, Ind. Joint Highway Research Project.
For primary bibliographic entry see Field 2G.
W76-08416

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME I.
Held at Sao Paulo, Brazil, 18-24 August 1974. Organized by Associacao Brasileira de Geologia de Engenharia, Sao Paulo, Brasil.

Descriptors: *Engineering geology, *Conferences, Seismology, Seismic properties, Soil properties, Soil engineering, Soil mechanics, Mapping, Rock fill, Testing procedures, Sandstones.

--Papers on the following themes are presented in this volume: I, Teaching and Training in Engineering Geology; II, Seismic Phenomena and Engineering Geology; III, Engineering Geology Related to Urban and Country Planning; IV, Engineering Properties and Classification of Natural Materials of Construction. Partial contents: Seismic Phenomena and Engineering Geology, by L. E. Oborn. Artifically Induced Seismicity and Associated Ground Motions, by S. K. Guha, and others. Microzonation in Relation to Engineering Soil Properties, by M. A. Sherif, and others. A Systematic Approach to Mapping Engineering Geology, by K. Grant. Negative Strength Regions in Offshore Construction, by R. C. Bostrom and M. A. Sherif. Soft Sandstones: Geotechnical Properties and Sensitivity to Moisture Changes, by M. E. Barton. Rockfill Testing in a Large Direct-Shear Device, by J. Dobr and A. Rozsypal. (See also W76-08418) (WES)
W76-08417

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME 2.
For primary bibliographic entry see Field 8E.
W76-08418

IMPROVEMENT OF CORE DRILL METHODS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. L. Gatz.
--Miscellaneous Paper No. S-75-17, June 1975. 35 p.

Descriptors: *Cohesionless soils, *Core drilling, New Mexico, Gravels, Sampling, Testing procedures, Cores.
Identifiers: Denison samplers, Membrane samplers.

--Results are presented of a program to evaluate effectiveness of more or less conventional subsurface samplers in obtaining representative and undisturbed samples of noncohesive alluvial materials containing large quantities of gravels and cobbles. This is the first phase of a research program to improve core drill methods. Samplers evaluated consisted of the Lawrence Livermore Laboratory membrane sampler, 4-in. Denison sampler, 6-in. Denison sampler, 5-in. Modified Denison sampler, and 3-in. thin-wall drive tube. Small representative samples were obtained with the Denison samplers; no undisturbed samples were obtained. The field work was accomplished in the Rhodes Canyon area, White Sands Missile Range, New Mexico. (WES)
W76-08419

PROPERTIES OF EXPANSIVE CLAY SOILS; REPORT 2, A NUMERICAL PROCEDURE FOR PREDICTING HEAVE WITH TIME,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. D. Johnson, and C. S. Desai.
--Miscellaneous Paper No. S-73-28, April 1975. 57 p, 33 ref.

Descriptors: *Heaving, *Finite difference analysis, Computer programs, *Testing procedures, *Clays, Soil properties.
Identifiers: *Expansive clays, *Soil swelling.

--A relatively economical and expedient numerical procedure and computer code based on the finite difference method were developed for predicting heave with time for heterogeneous expansive soils beneath structures idealized as two-dimensional. The computer code will also compute the potential heave assuming saturation of the foundation soils based on McDowell's swell data. The heave with time estimates should be useful for structures near which penetration of rainwater from the ground surface is permitted, provided that ponding of surface water and external water from leaking water and sewer lines does not occur. The required input data include the structural load, specific gravity, liquid and plastic limits, initial dry density and water content, coefficient of vertical permeability, ratio of the horizontal to the vertical coefficient of permeability, and swell and suction relationships of the foundation soils. (WES)
W76-08420

ARTIFICIALLY SIMULATING THE GEOLOGICAL HISTORY OF CLAY,
Imperial Coll. of Science and Technology, London (England).
J. L. Knill.
Prepared under contract for Final Technical Report, United States Army, European Research Office, (London) July 1974. 204 p, 80 ref.

Descriptors: *Clays, Simulation analysis, *Consolidation, Measuring instruments, *Geologic history, *Soil compaction, *Pore pressure, Pore water, Testing, *Soil tests, Strain measurement.
Identifiers: Artificial simulation(Soils), Clay sediments.

Report is concerned with the description of the development and research application of a high pressure consolidation cell, designed to simulate the progressive burial of clay sediments. The cell is described in detail by reference to the pre-July 1973 and July 1974 states of mechanical and electrical development. Results of a series of nine high pressure tests, four low pressure tests with elevated temperature and four constant rate of strain tests are presented. These results include information on the e-log p, relationships, variations in pore pressure and pore water chemistry and fabric changes preliminary explanations of the observed phenomena are offered. Attention is drawn to geological implications and reference also made to future trends in the research program. (WES)
W76-08421

SOIL STABILIZATION WITH POWDERED AND COARSE QUICKLIME,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
W. C. Allanach, Jr.
Master's thesis, 1974. 70 p, 15 ref.

Descriptors: Lime, *Soil stabilization, *Clays, *Compressive strength, *X-ray diffraction, Infrared radiation, Spectroscopy, *Electron microscopy, Analytical techniques.
Identifiers: Quicklime, *Infrared spectroscopy.

Study of the relative stabilizing effects of coarse and powdered quicklime on clay was accomplished using strength gain as the basis of comparison as determined by an unconfined compression test. Correlation of strength gain with alteration of the clay fabric an identification of reaction products formed was made possible through the use of X-ray diffraction, infrared spectroscopy, and electron microscopy. The powdered quicklime showed the greatest strength gain which was attributed to its higher degree of dispersion throughout the lime-clay-water system. This was confirmed by the micromorphologic studies showing altered clay fabric over a larger area of the specimens than in the coarse quicklime-treated specimens. The most distinctive reaction product, calcium-silicate hydrate, CSH, as viewed with the electron microscope, also showed more uniform distribution in the powdered quicklime-treated samples. (WES)
W76-08422

APPLICATION OF THE FINITE ELEMENT METHOD IN FOUNDATION ENGINEERING (DIE ANWENDUNG DER METHODE DER FINITEN ELEMENTE IN DER GRUNDBAUPRAXIS),
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
R. F. Buchmaier.
Report KFK-CAD 1, December 1974. 170 p, 49 ref.

Descriptors: *Finite element analysis, Design, *Soil stability, *Seepage, *Soil dynamics, *Soil compaction, Soil mechanics, *Foundation investigations.
Identifiers: Soil statics.

A summary is presented of the possibilities of applying finite element techniques (FEM) to foundation engineering problems. Theoretical aspects and the special limitations as well as the techniques of dealing with time-dependent and nonlinear problems are considered. The inherent mechanical behavior of soils and its input into the numerical procedure are discussed with reference to problems of soil statics, seepage, consolidation, and soil dynamics. Each type of problem is documented by examples. In addition, existing FEM programs have been listed resulting from an international request. Results of the study are planned to be implemented into future research organization of FEM development in the field of foundation engineering. (WES)
W76-08423

EARTH PRESSURE OBSERVATIONS ON A RETAINING WALL IN EXPANSIVE CLAY, GOUGHER STREET MAIL EXCHANGE, ADELAIDE,
Commonwealth Scientific and Industrial Research Organization, Camberra, Australia, Division of Applied Geomechanics.
M. Kurzeme, and B. G. Richards.
Technical Report N. 17, 1974. 45p.

Descriptors: *Earth pressure, Measurement, *Retaining walls, *Clays, *Soil pressure, Hygrometry, *Pressure measuring instruments, Australia, Testing, Testing procedures.
Identifiers: Expansive clays, Psychometers, Pressure cells(Soils).

A section of a basement retaining wall in Adelaide, 25m long and 7.5m high, has been extensively instrumented. Basement is located in a moisture-sensitive expansive clay subjected to changes in the moisture environment. Instrumentation comprises 24 earth pressure cells at the wall/clay interface and 31 psychrometers in clay mass behind the wall. Earth pressures are being measured, together with changes, in the moisture environment, for comparison with current design assumptions, and with predictions from more advanced methods of modeling the interacting retaining wall/clay system. Instrument installation was accompanied by a comprehensive sampling and laboratory testing program, design to measure material properties relevant to available models of material behavior. Results of the laboratory testing and the field observations for the first two years are presented and discussed. (WES)
W76-08424

SCHRIFTENREIH, (OTTO-GRAF-INSTITUT), (IN GERMAN).
Stuttgart Univ. (West Germany). Otto-Graf-Institut.
Report No. 64. Stuttgart, 1974.

Descriptors: *Slope stabilization, *Plastic deformation, *Underground construction, *Slope protection, Electro-osmosis, Drains, *Soil tests, *Soil analysis, Sampling.
Identifiers: Drainholes.

This publication contains papers written by the staff of the Otto-Graf-Institut in 1970-73. Contents include: Sanierung von Boschungsrutschungen durch Anwendung von Horizontal-Drainagebohrungen und Elektroosmose (Prevention of Slope Slides by the Application of Horizontal Drainholes and Electroomosis), by K. F. Henke. Steifenkraftmessungen beim U-Bahn-Bau in Stuttgart (Stiffness Measurements for the Subway Construction in Stuttgart), by K. F. Henke. Die Mechanisierung der Bodenprobenaufbereitung und der Bestimmung der Ausrollgrenze nach Atterberg (Mechanization of the Preparation of Soil Samples and Determination of Plastic Limit According to Atterberg), by W. Kaiser and G.C.W. Gay. Ein Verfahren zur Ermittlung der Steifeziffer des Bodens in naturlicher Lagerung (Procedure for Determining Stiffness Coefficient of Soil under Natural Bedding Conditions), by K. F. Henke, and others. (WES)
W76-08425

EVALUATION OF BENTONITE CLAY FOR WATERPROOFING FOUNDATION WALLS BELOW GRADE,
Construction Engineering Research Lab. (Army), Champaign, Ill.
S. M. Kanarowski.
Technical Report M-93, May 1975. 48 p.

Descriptors: *Waterproofing, *Foundations, *Bentonite, *Clays, Evaluation, Cost comparisons.
Identifiers: Bentonite clay panels, Bentonite spray.

Bentonite clay panels and bentonite spray are evaluated for waterproofing the exterior surface of foundation walls below grade. The evaluation is based on a field letter survey and contacts with users, architects, and installers of bentonite panels; and users, architects, contractors, and applicators of bentonite spray. Two installations were observed to provide first-hand data. Both bentonite systems performed favorably at a cost comparable to conventional systems, but lower than most elastomeric systems. Installation is easy and fast and both systems can be backfilled immediately after application. Product information, including responses from the field, cost comparisons, and advantages and limitations for both materials, is given. (WES)
W76-08427

8E. Rock Mechanics and Geology

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME I.
For primary bibliographic entry see Field 8D.
W76-08417

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME 2.
Held at Sao Paulo, Brazil, 18-24 August 1974. Organized by Associacao Brasileira de Geologia de Engenharia, Sao Paulo, Brazil.

Descriptors: *Engineering geology, *Conferences, *Dam foundations, *Underground structures, *Rock mechanics, Rock properties, Concrete, Corrosion, Tunnels, Slopes, Shear strength, Stress.

--Papers on the following themes are presented in this volume: V, Mass Movements; VI, Engineering Geology Related to Dam Foundations; VII, Engineering Geology and Underground Construction. Partial contents: Rock Stability Analysis: Discontinuities Shear Strength Parameters and Prestressing Costs, by M. D. Ruiz. Experimental Approach to the Study of Mechanisms of Structural Controlled Slope Movements in Rock Masses, by W. L. Furlinger. Stabilization of Landslides in Weathered Clay-Shale Using Pretensioned Grouted Anchors, by K. F. Henke. Geological Models of Development of Seepage Soil Deformations in Poland, by J. Liszkowski: Engineering Geology Related to Dam Foundations, by J. L. Knill. Geological Investigation of Sao Simao Dam (Brazil), by S. Brito, and others. Engineering Geology and Underground Construction, by D. U. Deere, and others. Investigations on Concrete Corrosion in the Sao Paulo Metro, by N. J. Chiossi. (See also W76-08417) (WES)
W76-08418

8F. Concrete

POLYETHYLENE PIPE SOLVES PROBLEM OF FORCE MAIN SEWER LINE INSTALLATION ACROSS INLAND WATERWAY.
Water and Sewage Works, Vol. 120, No. 8, p 54-55, August, 1973. 2 fig.

Descriptors: *Sewers, *Construction, Channels, Plastic pipes, Installation, Sewerage, Joints(Connections), Concrete structures, New Jersey.
Identifiers: Wildwood(NJ), Polyethylene pipe.

The installation of a force main sewer across the Middle Thorofare Channel in Wildwood, New Jersey, required less than six hours. The 1320-foot long, 14-inch diameter line now connects Diamond Beach to the area's main sewer. Guard boats stood watch on both approaches to the channel as a wire cable, pulled by a truck-mounted winch, hauled the high density polyethylene plastic pipe across the waterway. Concrete collars were placed around the circumference of the pipe to sink it. When the pipe reached its destination on the north bank of the channel, it was filled with water to further aid in the sinking process and settled into an already prepared trench, four feet deep. The flexibility of the pipe permits it to contour to the channel bottom. The entire 1320-foot length of pipe in 40-foot sections was joined in two days by a three-man crew. Joining the sections required from 20 to 25 minutes for each joint of this particular diameter. (Sandoski-FIRL)
W76-08236

HALF-SECTION PIPE USED EFFECTIVELY,
A. R. Pagan.
Public Works, Vol. 104, No. 10, p 94, October, 1973. 3 fig.

Descriptors: *Construction, *Drainage systems, Concrete pipes, Highways, Outlets, Outfall sewers, Flow, Concrete construction, New Jersey.
Identifiers: Paramus(NJ).

In extending a highway in Paramus, New Jersey, the outfall from part of the drainage system consisted of half-section reinforced concrete pipe. The half-sections were bedded on a 2-foot thick by 8-foot wide cushion of 1.5-inch broken stone, which was shaped to the curvature of the pipe to allow 12-inch stone imbedding. This procedure provided both a satisfactory support for the pipe and its immobility during other construction operations in the vicinity. A reasonable capacity for a section of this size on the slope given is approximately 75 cfs. This would indicate a depth of flow of about 18 inches and provide nine inches of freeboard. (Sandoski-FIRL)
W76-08237

FAST REPLACEMENT OF A FLOOD-DAMAGED INTERCEPTOR,
Metropolitan Denver Sewage Disposal District No. 1, Commerce City, Colo.
W. E. Korbitz, J. L. Puntenney, and A. M. Holst.
Public Works, Vol. 104, No. 10, p 95-96, October, 1973. 2 fig.

Descriptors: *Flood damage, *Interceptor sewers, Repairing, Public health, Reinforced concrete, Concrete pipes, Sewerage, Costs.
Identifiers: Sewer repair.

On May 6, 1973, flood waters in the Metropolitan Denver area washed out more than 200 feet of interceptor sewer. This damage required immediate action by the District to protect the public health

and to save the sewerage facilities. The actual repair work began on May 12; the pipe repair portion of the work was completed so that flow returned to the sewer on May 20. As much of the bolted pipe as was usable (112 feet) was salvaged for replacement and the amount of standard reinforced concrete pipe (120 feet) needed to complete the project was purchased. A reinforced concrete base was first constructed to support the pipe which was placed on the base the following day. A steel reinforced concrete encasement was poured around the pipe. The pipe replacement work and sewer cleaning work were accomplished in accordance with the provisions of a negotiated incentive contract. The actual total cost for the pipe replacement and sewer cleaning work was about $34,100, well below the original engineering estimate of $50,000. (Sandoski-FIRL)
W76-08240

NONLINEAR EARTHQUAKE RESPONSE OF CONCRETE GRAVITY DAMS,
California Univ., Berkeley. Earthquake Engineering Research Center.
N. Pal.
Report No. EERC 74-14, December 1974. 88 p, 40 ref.

Descriptors: *Earthquake engineering, *Concrete dams, Cracks, *Gravity dams, Dynamics, Stress, *Mathematical models, Simulation analysis, Earthquakes, Concrete testing, Strain measurement, Mechanical properties.

A mathematicl model is proposed for the mechanical properties -- constitutive relation and strength -- of concrete subject to dynamic cyclic reversible stresses and strains that may occur in gravity dams subjected to earthquake ground motion. The model describes properties of concrete under a two-dimensional state of stress. The effects of strain rate on the mechanical properties are incorporated in the model. Experimental results available in the literature form the basis for the proposed model. A method is developed for nonlinear analysis of response of concrete gravity dams to earthquake ground motion wherein mechanical properties of concrete are defined by the mathematical model. Earthquake analyses reveal that cracking of concrete is confined to areas near the upstream and downstream faces of dams -- especially in the upper parts and in some cases also near the heel. It is demonstrated that the extent of cracking in dams is quite sensitive to the mechanical properties of concrete. (WES)
W76-08426

8G. Materials

UNDERGROUND DETENTION FOR STORM OVERFLOWS.
Public Works, Vol. 104, No. 10, p 116, October, 1973. 1 fig.

Descriptors: *Underground structures, Combined sewers, Storm water, Plastics, Storage, Sewerage, Waste water treatment, Weirs, Storm runoff, Sewerage, Municipal wastes, Construction materials, Detention reservoirs.

An underground, plastic-encased basin of sand and gravel has been designed and engineered. The patented 'Geo-Cel' concept is intended to give partial treatment and to hold pollutants flushed from combined sewers in the first twenty minutes of a storm. The first such facility is being installed at Akron, Ohio. The detention basin was constructed by lining a pit with Goodyear's leakproof 30-mil Vinaliner sheeting and filling it with sand and gravel to within three feet of the surface. The gravel was then covered with 10-mil Vinaliner and earth fill placed to original grade. A concrete clarification chamber was built at one side of the detention basin. Storm-flushed material from the combined sewer enters the clarification chamber where chlorine is added and some solids settle out. Waste water then passes over a weir into the Geo-Cel for storage. When the storm subsides, the Geo-Cel's contents are returned to the city's sewer system for complete treatment at a municipal plant. Cost is said to be less than one-third that of a conventional treatment facility and the system has a design life of 25 to 40 years. (Sandoski-FIRL)
W76-08234

SAFEGUARD FLUID-HANDLING EQUIPMENT WITH PIPELINE BASKET STRAINERS,
Hayward Mfg., Co., Inc., Elizabeth, N. J.
H. Paitchell.
Plant Engineering, Vol. 27, No. 19, p 120-123, September 20, 1973. 5 fig.

Descriptors: *Pipelines, *Equipment, Cleaning, Pipes, Construction materials, Screens.
Identifiers: Basket strainers.

A simple device designed to protect fluid handling equipment, avoid shutdowns, and ensure cleaner products is the basket strainer. Because it has no moving parts to wear out, a basket strainer virtually lasts forever. Basket strainers are installed in liquid lines that require regular or frequent cleaning and hold considerably more material and produce less pressure drop than Y-strainers. Basket strainers, installed upright in a horizontal run of pipe, usually are larger in diameter than the size of the pipeline. For cleaning, the basket is lifted out from the top, a practice especially useful when the filled basket is heavy. The efficiency of a basket strainer depends on how well it is matched to the application. Several points to be investigated prior to selecting a strainer include: ratio of screen area to pipe area, size of strainer openings, basket cleaning requirements, overall size, and construction materials. (Sandoski-FIRL)
W76-08235

PORE SIZE DISTRIBUTION OF COMPACTED SOILS AFTER CRITICAL REGION DRYING,
Purdue Univ., Lafayette, Ind. Joint Highway Research Project.
For primary bibliographic entry see Field 2G.
W76-08416

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME I.
For primary bibliographic entry see Field 8D.
W76-08417

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME 2.
For primary bibliographic entry see Field 8E.
W76-08418

IMPROVEMENT OF CORE DRILL METHODS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W76-08419

PROPERTIES OF EXPANSIVE CLAY SOILS; REPORT 2, A NUMERICAL PROCEDURE FOR PREDICTING HEAVE WITH TIME,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W76-08420

ARTIFICIALLY SIMULATING THE GEOLOGICAL HISTORY OF CLAY,
Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 8D.
W76-08421

SOIL STABILIZATION WITH POWDERED AND COARSE QUICKLIME,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 8D.
W76-08422

APPLICATION OF THE FINITE ELEMENT METHOD IN FOUNDATION ENGINEERING (DIE ANWENDUNG DER METHODE DER FINITEN ELEMENTE IN DER GRUNDBAUPRAXIS),
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
For primary bibliographic entry see Field 8D.
W76-08423

EARTH PRESSURE OBSERVATIONS ON A RETAINING WALL IN EXPANSIVE CLAY, GOUGHER STREET MAIL EXCHANGE, ADELAIDE,
Commonwealth Scientific and Industrial Research Organization, Camberra, Australia, Division of Applied Geomechanics.
For primary bibliographic entry see Field 8D.
W76-08424

SCHRIFTENREIH, (OTTO-GRAF-INSTITUT), (IN GERMAN).
Stuttgart Univ. (West Germany). Otto-Graf-Institut.
For primary bibliographic entry see Field 8D.
W76-08425

EVALUATION OF BENTONITE CLAY FOR WATERPROOFING FOUNDATION WALLS BELOW GRADE,
Construction Engineering Research Lab. (Army), Champaign, Ill.
For primary bibliographic entry see Field 8D.
W76-08427

OUTFLOW FROM VARIOUS SUBSURFACE DRAINAGE MATERIALS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 4A.
W76-08669

8I. Fisheries Engineering

PERFORATED-PIPE WATER INTAKE FOR FISH PROTECTION,
Burns and Roe, Inc., Hempstead, N. Y.
R. T. Richards, and M. J. Hroncich.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11900, p 139-149, February 1976. 12 fig, 1 ref.

Descriptors: *Intakes structures, *Fish barriers, *Screens, *Hydraulics, *Laboratory tests, Velocity, Maintenance, Uniform flow, Fish conservation, Design, Fish handling facilities.
Identifiers: *Internal perforated sleeve, Approach velocity.

Since a major concern in the design of pumping station water intakes is the possibility of damage by fish drawn into the facility, some kind of screening system must be installed to minimize or eliminate this possibility. The potentially adverse impact of water intakes is resolved by the implementation of physical screens, which exclude all debris, including fish. The germane difficulties of screens, i.e., the necessity of lowering the approach velocity, poor velocity distribution across the screen, and danger to fish are overcome by the

installation of a perforated-pipe inlet with an added internal perforated sleeve. The benefits of such a device, i.e., relative ease of maintenance, uniform approach velocity, uniform inflow, and protection for fish, cannot be equalled by ordinary means of physical screening. For water intakes up to 100,000 gal/min, the inner sleeve type of perforated-pipe intake provides a viable solution to the problem of screening. (Singh-ISWS)
W76-08137

DEVELOPMENT TRENDS IN METHODS USED TO MODEL POPULATIONS AND COMMUNITIES,
V. V. Mehshytkyh.
Available from the National Technical Information Service, Springfield, Va 22161 as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. National Science Foundation Technical Translation 73-55111, 1975. 306 p. 71 fig., 15 tab., 304 ref. Trans. of Matematicheskoye Modelirovaniye Populatsii I Soobshchestv Vodnykh Zhivontnykh, Nauka, Leningrad, 1971.

Descriptors: *Productivity, *Model studies, *Methodology, *Mathematical models, *Biological communities, *Fish populations, Energy transfer, Monte Carlo method, Lakes, Algorithms, Digital computers, Graphical methods, Competition, Ecosystems, Aquatic animals.
Identifiers: USSR.

The most efficient mathematical models of aquatic animal populations and communities use electronic digital computers. Models of aquatic ecology are described which were used to verify hypotheses and indicate new dependencies and correlations. They can determine, specify, and predict population and community characteristics which cannot be measured directly. A model of perch populations explains perch population structure and predicts structures in other lakes with different ecologies, showing that computer modelling of real populations can solve practical fishing problems. A cybernetic experiment using a model permitted study of population properties; characteristics common to all populations can be calculated from knowledge of development of individuals and external conditions. Graph theory methods were applied to trophic networks in aquatic animal communities. Modelling necessitated development of specialized algorithmic language of community structure and complexity. Examples demonstrate how complex and unexpected reciprocal dynamics of even simple populations are. Fish fry mortality was studied using a model of diatoms and perch populations. A model of a pelagic fish community was used to examine some theories. This work demonstrates, by taking a series of theoretical and practical examples of modeling, that joint interdisciplinary efforts can solve the problem of rational exploitation of resources. (Buchanan-Davidson--Wisconsin)
W76-08212

DEVELOPMENT TRENDS IN METHODS USED TO MODEL POPULATIONS AND COMMUNITIES,
V. V. Mehshytkyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-55111, 1975, p. 7-58. 9 fig.

Descriptors: *Model studies, *Mathematical models, *Systems analysis, *Methodology, *Fish populations, *Biological communities, Ecosystems, Computers, Input-Output analysis, Aquatic animals, Environmental effects, Mortality, Fish reproduction, Equations, Foreign research.

The basis of modeling is the application of cybernetic conceptions and ideas and of general systems theory. The principal traits and properties necessary for practical application to populations of aquatic animals are outlined. Each system consists of interrelated elements which form a single whole. The environment acts on systems by inputs, and the system acts on the environment through outputs. This study was limited to interrelationships, inputs, and outputs of food-fish populations. Study of properties characterizing populations and communities of aquatic animals was approached from a systems point of view. The most common, efficient, and often the only possible method of investigating such systems is modelling--a practical or theoretical method permitting use of a secondary, natural, or artificial system (model) that reflects the object investigated. Using predetermined mathematical models of populations and communities, the substance, peculiarities, defects, and advantages of continuous-continuous, discrete-continuous, and discrete-discrete models for study of natural mortality among fish can be determined. Mathematical models of aquatic animal populations using differential equations are the most common and best defined methods available. Mathematical models of communities and ecosystems are analyzed; the most efficient and promising method is based on finite differences equations and uses electronic computers. (Buchanan-Davidson--Wisconsin)
W76-08213

THEORETICAL BASES OF MODELLING OF POPULATIONS AND COMMUNITIES OF AQUATIC ANIMALS,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-5511, 1975, p. 59-89. 1 fig., 1 tab.

Descriptors: *Methodology, *Model studies, *Mathematical models, *Populations, *Biological communities, *Aquatic animals, Ecology, Time, Kinetics, Reproduction, Energy transfer, Foreign research.

Precise definitions and quantitative interpretations of ecological concepts are necessary for construction of mathematical models of populations and communities of aquatic animals. Models in which the main relationships between individuals or populations are the energy transfer are analyzed. These models represent certain systems including separate elements; the state of a system is determined by selection of its variables and examined in units of time. Input is examined in the same time units. The system interacts with the medium (system output). Model construction consists of establishing relationships between state of the system in the preceding moment of time, input, state at a given time, and output. Concepts, definitions, and relations needed to construct models of populations and communities of aquatic animals are described. The state of the individual has the following components: existence, development stage, age, sex, body mass, and caloric value. Input consists of medium temperature, food required, consumption of individual by a predator, capture by fishing, death from other sources, and/or relationships between egg-laying by another and appearance of this individual. Output consisted of metabolic energy, food required, eggs spawned, and excretions. Reproduction relationships between individuals are described. Models of groups of individuals, populations, and communities are discussed. (Buchanan-Davidson--Wisconsin)
W76-08214

ABSTRACT MODELS OF FISH POPULATIONS,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-5511, 1975, p. 90-112. 10 fig., 5 tab.

Descriptors: *Model studies, *Mathematical models, *Fish populations, *Methodology, Computers, Growth rates, Fish food organisms, Spawning, Energy transfer, Fish harvest, Feeding rates, Biological communities, Dynamics, Biomass, Algorithms, Foreign research.

The theoretical elaboration of modelling principles for food-fish populations on electronic computers is presented. A population of food-fish, where replenishment and growth are independent of external conditions, was used. Several fish population models are examined. To study questions concerning interaction with feeding, processes of qualitative variation in spawning schools, and the reciprocal influence of related generations, study of population from an energy point of view is necessary. This model was used to determine the influence of changes in the feeding basis on the dynamics of the population and on the catch. The greater the period of variation in the feeding basis, the more intricate the structure of the oscillations of the food-fish yield. Not every periodic change in food-fish yield should be related to periodic variations in the feeding basis. The results show the value in applying the energy principle to the modelling of a fish population, especially modelling of communities. Laws for the conservation of matter and energy make it possible to show a resemblance between the model and the original and to avoid mistakes. (Buchanan-Davidson--Wisconsin)
W76-08215

MODELS OF ACTUAL FISH POPULATIONS,
V. V. Mehshythyh.
In: National Science Foundation Technical Translation 73-5511, 1975, p. 113-146. 9 fig., 5 tab.

Descriptors: *Fish populations, *Model studies, *Computers, *Mathematical models, *Methodology, Spawning, Mortality, Perches, Sockeye salmon, Fishing, Forecasting, Predation, Fish harvest, Algrithms, Foreigh research.
Identifiers: Lake Tyuleny(USSR), Ozernaya River(USSR), Karlian Istmus(USSR), Kamchatka(USSR).

The practical application of principles for modelling fish-food populations on electronic computers is illustrates with data obtained on the perch population in Lake Tyuleny, on the Karelian Istmus. Population properties and behavior were defined by action exerted from external and internal parameters. After 20-25 years, the population always followed a regular cycle. An optimum fishing scheme which considers the cyclic nature of productivity is needed by the fishing industry. The sockeye or red salmon population of the Ozernaya River in Kamchatka was also studied. Correlations were determined between numbers spawning and egg survival. The model can be used for fishery forecasts, although coefficients of natural mortality were uncertain. Forecasts can be made for the year after spawning or longer, but satisfactory results were only obtained the first 2-3 years, then became meaningless. By using these models, an objective estimation of the influence of a certain parameter on forecast precision became possible. The model permits practical, quantitative correlations between deep sea and coastal fishing. It can be used to detect trends or estimate average values. Even if the results are only approximate, they may indicate factors which influence the food-fish population, yields, and the interdependence of variations in these values. (Buchanan-Davidson--Wisconsin)
W76-08216

MODELS OF POPULATIONS OF AQUATIC INVERTEBRATES,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161 as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-5511, 1975, p. 147-178. 13 fig., 4 tab.

Descriptors: *Invertebrates, *Model studies, *Mathematic studies, *Methodology, Crustaceans, Fish food organisms, Populations, Computers, Productivity, Mortality, Predation, Reproduction, Biomass, Feeding rates, Growth rates, Age, Energy transfer, Foreign research.

Methods to model populations of fish food organisms are described. Formulae are given to express continuous time conceptions and for calculating biomass, its stability and the influence of the production process based on amount of food and predation. A population model includes the definition of operations of metabolic expenditures, and a total maximum ration of the biomass of the population of planktonic crustaceans in which the life cycle of each individual is examined separately with the growth and mortality as random variables. Algorithms are given of a generation or a population of individuals reproducing only once, of a population of planktonic crustaceans with an extended reproductive period, and a flow chart of the modeling algorithm of the probabilities within the model of a crustacean population. (Auen-Wisconsin)
W76-08217

ABSTRACT MODELS OF COMMUNITIES OF AQUATIC ANIMALS,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-5511, 1975, p. 179-206. 14 fig., 1 tab.

Descriptors: *Methodology, *Model studies, *Digital computers, *Graphical methods, *Biological communities, *Aquatic animals, Equations, Food chains, Energy transfer, Biomass, Algorithms, Foreign research.
Identifiers: Formulae.

Studies of properties of aquatic organism communities with models constructed on the basis of differential equations give clear results only in simple cases; more complex situations require use of electronic computers. Frequently complete knowledge of dynamic properties of a system is not required. Graph theory studies of two predator-prey populations show that effective energy transfer in the trophic chain and the relation of the population's biomass in the community depend on many parameters. Properties of more complex communities can be determined without solving systems of differential or finite differences equations; however this method is unsuitable for study of transitional schemes of a community or reactions to sudden changes in external conditions. The correlations only reflect the balanced, stable state of the system. If parameters vary widely, the results may be unreliable. The graph theory method is clear and mathematically simple. A universal model suitable for communities with any number of populations is also described, which used a digital computer. Statistical and dynamic characteristics of communities of aquatic animals with trophic networks of any complexity can be studied by this method. However an element of the community was simplified: the state of the population is described by a single variable, its biomass. (Buchanan-Davidson--Wisconsin)
W76-08218

MODELS OF ACTUAL COMMUNITIES,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-551, 1975, p. 207-264. 18 fig., 7 tab.

Descriptors: *Model studies, *Mathematical models, *Fish populations, Biloogical communities, Methodology, Mortality, Productivity, Reproduction, Fish food organisms, Spawning, Sockeye salmon, Algrithms, Predation, Biomass, Feeding rates, Perches, Fry, Histograms, Sticklebacks, Fluctuations, Dynamics, Yield equations.
Identifiers: *Lake Dalny(USSR), *Lake Razdelny(Karelian Istmus). U.S.S.R.

To understand perch fry mortality, a model representing interactions between zooplankton population and perch fry in Lake Razdelny on the Karelian Istmus, is described. Food was the factor regulating fish numbers during early development. A model of the relationship between fry and food organisms shows that when lake temperature increased slowly, fry levels were high, and food supplies small, only a few fish survived. When the water was warm, food supply large, and consumer numbers low, most fry survived. The model of trophic interaction between fry and prevailing plankton populations elucidated many peculiarities of fry survival and showed that the influence of food on fry was decisive. A model of the Lake Dalny pelagic fish community which contained sockeye salmon, three-spined stickleback, and lake char is used to describe cyclic population variations. The influence of coastal salmon fishing on temporal characteristics of the number and ichthyomass of the stickleback was strong and readily detected, but char populations did not depend on variations in salmon. Coastal salmon fishing influenced average values and temporal statistical characteristics of the Lake Dalny pelagic fish community. Broad generalizations about population dynamics and community numbers and biomass cannot be made from present knowledge with accuracy. (Buchanan-Davidson--Wisconsin)
W76-08219

STUDIES ON THE HOST SPECIFICITY OF THE EYEFLUKE DIPLOSTOMUM SPATHACEUM, IN BROWN AND RAINBOW TROUT,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
For primary bibliographic entry see Field 5C.
W76-08302

REARING THE SEVAN TROUT AT THE AIGERLICH TROUT POND FISHERY, (IN ARMENIAN),
For primary bibliographic entry see Field 2I.
W76-08371

ECOLOGY AND PROSPECTS OF USING THE AMPHIPOD GAMMARUS (R.) BALCANICUS SCHAEF, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 2I.
W76-08410

AN EXPERIMENT ON THE FEEDING OF FRY OF CATFISH HETEROPNEUSTES FOSSILIS,
Bangladesh Agricultural Univ., Mymensingh. Faculty of Fisheries.
For primary bibliographic entry see Field 2I.
W76-08575

SAVANNAH RIVER LABORATORY ENVIRONMENTAL TRANSPORT AND EFFECTS RESEARCH ANNUAL REPORT - 1974.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W76-08596

ENTRAINMENT AND INTAKE SCREENING, PROCEEDINGS OF THE SECOND ENTRAINMENT AND INTAKE SCREENING WORKSHOP.
Electric Power Research Inst., Palo Alto, Calif.
EPRI Report No. 15, December 1974. 347 p, Editor Jensen, L. D., Held at the Johns Hopkins University, Baltimore, Maryland, on February 5-9, 1973.

Descriptors: *Conferences, *Entrainment, Intakes, Hydraulic structures, Screens, Fish, Plankton, Thermal stress, Mortality, Design.

The manuscript of the workshop proceedings presents a summary of state-of-the-art information relative to the effects of entrainment of planktonic organisms into cooling water systems and hydraulic intrapment of fish into intake and screening structures located in a variety of surface waters throughout the United States. A total of 34 papers is included. (See W76-08629 thru W76-08662) (Chilton-ORNL)
W76-08628

EVALUATION OF ENTRAINMENT EFFECT,
Oak Ridge National Lab., Tenn.
C. C. Coutant.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 1-11, 2 tab, 16 fig, 8 ref.

Descriptors: Fish handling facilities, *Environmental effects, *Entrainment, Evaluation, Powerplants, Aquatic life.

A conceptual framework for analyzing the impacts of power plant entrainment on aquatic life and man's environment is presented. The framework is a linear sequence of environmental impacts which are identified as: the sources of potential biological damage associated with entrainment and impingement, the probability of involvement of susceptible organisms, the probability of direct biological damage, the population effects, and the social impact. The report does not explicitly include a format for considering all ecological complexity but it does provide a logical framework on which to build a site-specific analysis. (See also W76-08628) (Chilton-ORNL)
W76-08629

ZOOPLANKTON SURVIVAL IN COOLING WATER SYSTEMS OF FOUR THERMAL POWER PLANTS ON THE CALIFORNIA COAST-INTERIM REPORT. MARCH 1971-JANUARY 1972,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
For primary bibliographic entry see Field 5C.
W76-08630

ENTRAINMENT AND THERMAL EFFECTS ON A MYSID SHRIMP AND STRIPED BASS IN THE SACRAMENTO-SAN JOAQUIN DELTA,
California State Dept. of Fish and Game, Stockton. Delta Fish and Wildlife Study.
For primary bibliographic entry see Field 5C.
W76-08631

SUMMARY OF ENTRAINMENT RESEARCH AT THE MILLSTONE POINT NUCLEAR POWER STATION, 1970 TO 1972,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-08632

ENTRAINMENT STUDIES ON HUDSON RIVER ORGANISMS,
New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.
For primary bibliographic entry see Field 5C.
W76-08633

HUDSON RIVER STRIPED BASS LIFE CYCLE MODEL,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
For primary bibliographic entry see Field 5C.
W76-08634

ENTRAINMENT OF PLANKTONIC ORGANISMS INTO COOLING WATER SYSTEMS OF THREE MID-ATLANTIC THERMAL POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08635

PHYTOPLANKTON ENTRAINMENT STUDIES AT THE INDIAN RIVER ESTUARY, DELAWARE,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 5C.
W76-08636

EFFECTS OF CONDENSER ENTRAINMENT ON ALGAL PHOTOSYNTHESIS AT MID-ATLANTIC POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08637

EFFECTS OF CONDENSER DESTRUCTION OF ALGAE ON DISSOLVED OXYGEN LEVELS IN THE JAMES RIVER,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08638

ENTRAINMENT OF ZOOPLANKTON AT THREE MID-ATLANTIC POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08639

ZOOPLANKTON STUDIES AT MORGANTOWN,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W76-08640

THE EFFECTS OF ENTRAINMENT ON PHYTOPLANKTON AT THE MORGANTOWN STEAM ELECTRIC STATION, POTOMAC RIVER ESTUARY, SEPTEMBER 5-8, 1972,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W76-08641

MORGANTOWN ENTRAINMENT. PART IV. PHYTOPLANKTON TAXONOMIC STUDIES,
For primary bibliographic entry see Field 5C.
W76-08643

RESPONSE OF PHYTOPLANKTON TO THERMAL STRESS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W76-08644

ENTRAINMENT STUDIES AT TURKEY POINT ON BISCAYNE BAY: HAVE THERMAL EFFECTS AFFECTED THE PLANKTON OF BISCAYNE BAY,
Air and Water Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5C.
W76-08645

LABORATORY SIMULATION OF POWER PLANT EFFECTS: RESPONSE OF SOME ESTUARINE PHYTOPLANKTERS TO TIME TEMPERATURE COMBINATIONS,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5C.
W76-08646

TRAVELING SCREENS FOR TURBINE INTAKES OF HYDROELECTRIC DAMS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. E. Farr.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 199-203, 7 fig, 1 ref.

Descriptors: *Entrainment, *Screens, Fish, Fish behavoir, Intakes, Hydroelectric plants.

Modifications are reported in conventional vertical traveling screens which permit fish recovery rates without correspondingly large hydraulic head losses. The diverted fish enter gatewells above the intakes and pass through orifices into a central bypass conduit discharging at the tailrace. It was calculated that the system would be capable of diverting up to 90% of the seaward migrants out of the turbine intakes. (See also W76-08628) (Chilton-ORNL)
W76-08647

FISH DIVERSION SYSTEMS AND BIOLOGICAL INVESTIGATION OF HORIZONTAL TRAVELING SCREEN MODEL VII,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
E. F. Prentice, and F. J. Ossiander.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 205-214, 6 tab, 10 fig, 19 ref.

Descriptors: *Entrainment, *Screens, *Salmonids, Fry guiding, Mortality.

Tests were designed to gather information on the diversion efficiency of a horizontal traveling screen and to examine survival and the effect of impingement on the physical condition of young salmonids. Diversion efficiencies of the screen were about 97% or greater at normal velocities of 0.15 and 0.46 m/sec for fingerling and fry. No impingements were observed among fingerlings but fry readily impinged on the screen. At 0.15 m/sec velocity, survival of fry was independent of impingement time, but at 0.46 m/sec velocity, survival decreased as impingement time increased from 6 to 60 min. (See also W76-08628) (Chilton-ORNL)
W76-08648

MECHANICAL OPERATION OF HORIZONTAL TRAVELING SCREEN MODEL VII,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. E. Farr, and E. F. Prentice.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 215-222, 16 fig, 2 tab, 3 ref.

Descriptors: *Entrainment, *Screens, Salmonids, Mechanical equipment, Hydraulic machinery.

The mechanical and hydraulic features of a horizontal traveling screen which is designed to divert young salmon and steelhead trout are presented. Mechanical operation and performance assessment of a prototype are discussed and a number of recommendations are made for improvement of the screen. It was concluded that in general the concept of the screen is good in spite of operational, mechanical and hydraulic problems in the model. (See also W76-08628) (Chilton-ORNL)
W76-08649

VERTICAL TRAVELING FISH BASKET COLLECTOR,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
E. F. Prentice.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 223-224, 3 fig.

Descriptors: *Entrainment, *Mechanical equipment, Fish.

The study investigates the mechanical performance of a fish basket-collector which is designed to collect and remove fish and debris trapped in water intake canals and on intake screens. Effectiveness of a wash system is assessed in terms of proportional reduction in head loss during operations. (See also W76-08628) (Chilton-ORNL)
W76-08650

FISH PASSAGE THROUGH TURBINES, CONDUITS, AND SPILLWAY GATES,
Washington Univ., Seattle. Fisheries Research Inst.
M. C. Bell.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 251-261, 34 fig.

Descriptors: *Hydraulic equipment, *Diversion structures, *Entrainment, Dams, Conduits, Spillway gates, Turbines, Fish guiding.

Shearing action and mechanical damage were found to be the major causes of mortality of fish passing through various types of hydroelectric waterways. Other factors inside turbines that kill are the striking of fish by moving blades and the direct contact of fish with rigid parts of the equipment. It was noted that the fish in the center of a jet pass smoothly, but these in the outer layer are affected by the boundary conditions and are twisted and turned resulting in mechanical damage. The effects of cavitation which accounts for the decapitated fish and fish with missing pieces of flesh are discussed. Kaplan and Francis runners are discussed and it was found that Francis runners have less slack in their design as far as fish passage is concerned than do the adjustable Kaplan runners. (See also W76-08628) (Chilton-ORNL)
W76-08651

A FUNCTIONAL EVALUATION OF A LARGE LOUVER SCREEN INSTALLATION AND FISH FACILITIES RESEARCH ON CALIFORNIA WATER DIVERSION PROJECTS,
California State Dept. of Fish and Game, Stockton.
J. E. Skinner.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 225-249, 26 fig, 5 ref.

Descriptors: *Diversion structures, *Entrainment, *Fish handling facilities, Design criteria, Screens, California.

Identifiers: Sacramento River(Calif).

The objectives of the program described were to (1) develop biological design criteria for required fish facilities associated with a canal which would divert water from the Sacramento River to the Sacramento-San Joaquin Delta; and (2) develop operating criteria for the facilities. A primary concern was the development of a fish screen and other measures to minimize losses of fish, eggs and larvae from the Sacramento River. Observations on the swimming performance of salmon, steelhead and striped bass at varying water velocities showed that, in general, swimming performance varies directly with size and inversely with velocity. This relationship is critical for the smallest fish but diminishes as the fish get larger. A large louver screen and its effectiveness as a diversion device is discussed in relation to the swimming capabilities of various fish. (See also W76-08628)
W76-08652

NUMBERS OF INDIVIDUALS AND INJURY RATES OF FISHES CAUGHT ON REVOLVING SCREENS AT THE P. H. ROBINSON GENERATING STATION,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
A. M. Landry, Jr., and K. Strawn.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 263-271, 5 fig, 5 tab, 21 ref.

Descriptors: *Entrainment, *Screens, Fish, Mortality, Seasonal, Diurnal.

Samples taken during the 13 month study produced 68,518 fishes, comprising 83 species. February through June collections yielded more fish than other collections with March having the largest catch-per-effort totals of any month. In addition to this seasonal variation in catch, a diurnal variation was noted which was due to the light conditions making the screens vary in visibility. Injuries received by fish during impingement was varied. Water pressure or a combination of water pressure and floating mats of algae trapped and suffocated sick and weak fish. Small fish became gilled in the openings in the mesh. Impinged fish were also easy prey for blue crabs which were abundant in the intake canal during spring and summer. (See also W76-08628) (Chilton-ORNL)
W76-08653

ADAPTATION OF HYDRO FISH FACILITIES TO STEAM-ELECTRIC STATIONS,
Portland General Electric Company, Portland, Oregon, Department of Environmental Services.
G. J. Eicher.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 273-276, 24 ref.

Descriptors: *Entrainment, *Diversion structures, Hydraulic equipment, Electric power, Steam, Fish guiding.

Methods of fish diversion such as Wolfe traps, screens, louvers, and /electric barriers which are used at hydroelectric facilities are discussed as related to their possible use at steam electric facilities. It was concluded that the application of screening that is successful in hydro projects in many cases stands a good chance of being successful at steam electric stations and much of the experience gained with hydro is transferable. (See also W76-08628) (Chilton-ORNL)
W76-08654

CONVENTIONAL FISH SCREENING SYSTEMS AND SOME PROMISING ALTERNATIVES,
Kramer, Chin and Mayo, Inc. Seattle, Wash.
R. D. Mayo.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 277-279, 5 fig.

Descriptors: *Entrainment, *Hydraulic equipment, *Screens, Filters, Barriers, *Fish barriers, Fish handling facilities.

Screening systems are divided into four major categories for purposes of discussion; fixed screens, traveling screens, filter systems and behavioral barriers. The advantages and disadvantages of each of these types of systems with some alternatives to each is presented. (See also W76-08628) (Chilton-ORNL)
W76-08655

VULNERABILITY AND SURVIVAL OF YOUNG CONNECTICUT RIVER FISH ENTRAINED AT A NUCLEAR POWER PLANT,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
B. C. Marcy, Jr.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 281-288, 4 tab, 2 fig, 25 ref.

Descriptors: *Entrainment, *Mortality, Fish, Nuclear powerplants, Thermal stress, *Connecticut River.

Of the entrained species, 97.6% were alewives and blueback herring and 1.3% were white perch. Estimates of fish mortality due to mechanical damage during passage through the condenser cooling-water system averaged approximately 80%. Mortality attributed to heat shock or prolonged exposure to temperatures above 28 degrees C was 20%. The injection of sodium hypochlorite as a biocide produced no measurable differences in mortality. (See also W76-08628) (Chilton-ORNL)
W76-08656

STATUS OF AIR BUBBLE FISH PROTECTION SYSTEM AT INDIAN POINT STATION ON THE HUDSON RIVER,
Consolidated Edison Co. of New York, Inc., New York. Office of Environmental Affairs.
R. A. Alevras.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 289-291, 1 tab, 1 fig.

Descriptors: *Diversion structures, Fish, Seasonal, *Hudson River, New York.
Identifiers: *Air bubblers.

Various types of air bubbler systems were evaluated. The average number of fish collected per day during the test period exceeded the daily average during sampling periods before and after the test. The difference between the collecting periods may indicate a change in the density of fish in the vicinity of the intake. It was tentatively concluded that the air curtain did not appear to repel fish and may attract fish during hours of darkness. (See also W76-08628) (Chilton-ORNL)
W76-08657

PRELIMINARY STUDIES ON THE EFFECTS OF AIR BUBBLES AND INTENSE ILLUMINATION ON THE SWIMMING BEHAVIOR OF THE STRIPED BASS (MORONE SAXITALIS) AND THE GIZZARD SHAD (DOROSOMA CEPEDIANUM),
Westinghouse Electric Corp., Phildelphia, Pa. Environmental Systems. Dept.
P. N. Bibko, L. Wirtenan, and P. E. Kueser.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 293-304, 9 fig, 5 tab, 3 ref.

Descriptors: *Entrainment, *Diversion structures, Fish behavior, Striped bass, Light intensity.
Identifiers: Air-bubblers.

This study was performed specifically in an effort to (1) assess the influence of water velocity and water temperature on fish swimming behavior and (2) determine the efficiency of an air-bubble screen and intense illumination as deterrent devices. In still water both striped bass and gizzard shad swim in a random manner but when exposed to water velocity, fish orient into and swim against the on-coming current. The tendency of fish to cross air bubble screens was related to water temperature. The air-bubble screen seemed equally effective in deterring bass passage during the day and night when little ambient light was available. Intense illumination may be characterized as only a temporary deterrent. (See also W76-08628) (Chilton-ORNL)
W76-08658

EXPERIMENTAL STUDIES IN GUIDING MARINE FISHES OF SOUTHERN CALIFORNIA WITH SCREENS AND LOUVERS,
Ichthyological Associates, Inc., Middleton, Del.
V. J. Schuler.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 305-315, 2 tab, 10 fig, 5 ref.

Descriptors: Model studies, *Diversion structures, *Screens, *Fish guiding, Marine fish, California.

The program goals presented are concerned with determining and investigating those behavioral characteristics of marine fishes which can be used as parameters in the modification of existing, and the design of future, fish diversion-removal systems. This was a model study in which all parameters except fish size, velocity, and louver spacing were on a reduced scale. Test species guided better along an array of louvers than along screens and the highest degrees of guidance occurred with louvers spaced 2.54 cm apart set at 30 and 20 degrees to flow and with vanes normal to frame. (See also W76-08628) (Chilton-ORNL)
W76-08659

A HIGH CAPACITY SAND FILTER FOR THERMAL POWER PLANT COOLING WATER INTAKES PART I: MODEL STUDIES AND FOULING CONTROL TECHNIQUES,
Washington Univ., Seattle. Fisheries Research Inst.
Q. J. Stober, C. H. Hanson, and P. B. Swierkowski.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 317-334, 11 tab, 13 fig, 10 ref.

Descriptors: Model studies, *Filters, *Cooling water, Sands, Particle size, *Fouling, Control systems, *Entrainment.

A model rapid sand filter was tested and the optimal size for the anthracite-gravel filter media was found to be between 3/32 and 5/16 in. The coarseness of the media was restricted by the quantity and velocity of backwash water required to achieve bed expansion. Six fouling control techniques were evaluated, including backwash with ambient sea water, anoxia, single dose chlorination, heat treatment, chlorination and heat treatment during backwash and daily 2-hr

chlorination. Based on barnacle abundance and growth rates, the most effective fouling control techniques tested were backwashing with heated sea water, daily chlorination, and anoxia. (See also W76-08628) (Chilton-ORNL)
W76-08660

A HIGH CAPACITY SAND FILTER FOR THERMAL POWER PLANT COOLING WATER INTAKES PART II: DESIGN CONCEPT,
Northwest Nuclear Power Associates, Seattle, Wash.
H. V. Strandberg.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 335-343, 9 fig, 5 ref.

Descriptors: *Design, *Filters, *Thermal powerplants, Cooling water, *Entrainment.

The design concept presented is capable of providing cooling water at the rate of 1500 cubic feet per sec. Various aspects of the design which are presented include properties of the water to be filtered, filter rates, backwash requirements, operation and maintenance. Attractive attributes of the rapid sand filter include a low approach velocity, free tidal flow across the filter surface, and low profile and space requirements. Engineering drawings are presented to illustrate important features of the design. (See also W76-08628) (Chilton-ORNL)
W76-08661

DEVELOPMENT OF BIOLOGICAL DESIGN CRITERIA FOR FISH SCREENS AND BARRIERS,
Kramer, Chin and Mayo, Inc., Seattle, Wash.
J. L. Congleton.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 345-347, 4 fig, 3 ref.

Descriptors: *Entrainment, *Design criteria, *Screens, Barriers, Fish behavior.
Identifiers: Swimming performance.

Factors to be considered in design criteria are identified as swimming performance, behavior and impingement tolerance. The need for standardization in these areas is emphasized. (See also W76-08628) (Chilton-ORNL)
W76-08662

BIOLOGICAL BACKGROUND OF THE NEW ELEMENT OF STURGEON ARTIFICIAL REARING METHODS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
A. F. Gun'ko.
Vopr Ikhtiol. 14(6), p 1134-1136, 1974.

Descriptors: *Fish hatcheries.
Identifiers: *Fish breeding, *Sturgeon, Experiments.

Experiments with industrial breeding of sturgeons with high viability for many years yielded good quality sturgeon. Estuary water zooplankton and crustaceans for food and coexistence with other fish were necessary. Water volume, breeding periods, number of fish bred, viability of young fish and the daily food requirement were determined in the process of breeding young sturgeons in the Miusskii and Akhtanizovskii estuaries, USSR.--Copyright 1975, Biological Abstracts, Inc.
W76-08663

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT, WATER RESOURCES RESEARCH ACTIVITIES UNDER PUBLIC LAW 88-379, FISCAL YEAR 1975.
Georgia Inst. of Tech. Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 9D.
W76-08163

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT, WATER RESOURCES RESEARCH ACTIVITIES UNDER PUBLIC LAW 88-379, FISCAL YEAR 1975.
Georgia Inst. of Tech. Atlanta. Environmental Resources Center.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 294 $5.50 in paper copy, $2.25 in microfiche. Report ERC-1075, August 1975. 105 p. OWRT A-999-GA(3).

Descriptors: *Water Resources Research Act, *Projects, *Georgia, Research and development, Administration, Administrative agencies, Information exchange, Research priorities, Water resources.

Activities of the Environmental Resources Center in administering the Federal Water Resources Research Act in Georgia during Fiscal Year 1975 were reported. The Center is in the Office of Interdisciplinary Programs at the Georgia Institute of Technology. One of its main activities is managing the Allotment and Matching-grant projects in the Georgia Water Resources Research Program, for which Federal funds are provided by the Office of Water Research and Technology, U.S. Department of the Interior. The three parts of the annual report present summaries of: (1) Center research and information dissemination activities, (2) allotment projects, and (3) matching-grant projects during FY 1975. Eighteen allotment and twelve matching-grant projects undertook active research or were being completed. In addition, three new allotment projects and one new matching-grant project were selected for the next year. Lists of priority research needs developed by a Research Program Development Committee and Center publications were given. (Sims - ISWS)
W76-08163

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

LASER APPLICATIONS TO ATMOSPHERIC SCIENCES - A BIBLIOGRAPHY,
Old Dominion Univ., Norfolk, Va.
F. S. Harris, Jr.
Contractor Report NASA CR-2536, June 1975. 134 p, 1460 ref. NASA NGR 47-003-068.

Descriptors: *Bibliographies, *Remote sensing, *Atmosphere, Cloud physics, Clouds, Aerosols, Winds, Temperature, Turbulence, Air pollution, Instrumentation, Information retrieval, Documentation, Publications, Meteorology.
Identifiers: *Lasers.

This report contains a bibliography of 1460 references on the applications of lasers to atmospheric sciences. The subjects covered include: aerosols; clouds; the distribution and motion of atmospheric natural and man-made constituents; winds; temperature; turbulence; scintillation; elastic, Raman and resonance scattering; fluorescence; absorption and transmission; the application of the Doppler effect and visibility. Instrumentation, in particular lidar, is included, also data handling, and interpretation of the data for meteorological processes. Communications, geodesy and rangefinding are not included as distinct areas. The application to the atmosphere is covered, but not the ocean or its surface. (Sims-ISWS)
W76-08323

WATER YIELD IMPROVEMENT BY VEGETATION MANAGEMENT: FOCUS ON ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 03B.
W76-08539

CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS, A SELECTED, ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Information Center.
For primary bibliographic entry see Field 05C.
W76-08592

10F. Preparation Of Reviews

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
For primary bibliographic entry see Field 05C.
W76-08162

WATER YIELD IMPROVEMENT BY VEGETATION MANAGEMENT: FOCUS ON ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 03B.
W76-08539

SUBJECT INDEX

2-4-D
Detection of Salts of 2,4-D in Aqueous Solution by Laser Raman Spectroscopy,
W76-08254 5A

ABSORPTIOMETRIC METHOD
Absorptiometric Determination of Iron with T.P.T.Z.,
W76-08273 5A

ABSORPTION
Infiltration Analysis and Perturbation Methods 1. Absorption with Exponential Diffusivity,
W76-08334 2G

Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

The Influence of Water Quality on Accumulation of Heavy Metals in Aquatic Organisms,
W76-08456 5C

ACID MINE WATER
Control of Acid Mine Drainage.
W76-08156 5G

The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

Preparation of Plans and Specifications for Pollution Abatement Activities in Cherry Creek Watershed, Maryland.
W76-08385 5G

Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

ACIDIC WATER
Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

ACIDS
Use of Crushed Limestone to Neutralize Acid Wastes,
W76-08225 5G

Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

Re-Use and Disposal of Waste Acids,
W76-08721 5D

ACTIVATED CARBON
Elimination Method for Mercury Residue in Water (Suichu yozon suigin no jokyoho),
W76-08476 5D

Treatment of Dye Wastes with Granular Activated Carbon,
W76-08716 5D

ACTIVATED SLUDGE
Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

Emergency Equipment Utilization Keeps Effluent Clean,
W76-08265 5D

A Theoretical Study of Factors Influencing the Microbial Population Dynamics of the Activated-Sludge Process-II. A Computer-Simulation Study to Compare Two Methods of Plant Operation,
W76-08277 5D

Morrell Pioneers More Efficient Aeration,
W76-08286 5D

Design and Performance of Physical-Chemical and Activated Sludge Treatment for an Edible Oil Plant,
W76-08293 5D

Combined Treatment of Leather Tanning and Municipal Wastes at Grand Haven, Michigan,
W76-08294 5D

Study of the Effectiveness of Removing Heavy Metals in Biological Purification of Municipal Sewage, (In Russian),
W76-08580 5D

ACTUAL EVAPOTRANSPIRATION
A Model for Estimating Actual Evapotranspiration from Potential Evapotranspiration,
W76-08132 2D

ADENOSINE TRIPHOSPHATE
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

ADIRONDACK REGION (NY)
Reassessment of Mercury in Surface Water in the Adirondack Region, New York,
W76-08554 2K

ADMINISTRATION
Water Pollution Control Act of 1972, Institutional Assessment, Planning.
W76-08192 5G

The Water Pollution Control Act of 1972, Institutional Assessment, The Permit Program.
W76-08193 5G

ADMINISTRATIVE AGENCIES
The Water Pollution Control Act of 1972, Institutional Assessment, The Permit Program.
W76-08193 5G

ADSORPTION
Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

Phosphorus Movement in Soils: Soil-Orthophosphate Reaction Kinetics,
W76-08672 5B

Fluoride Removal: Technology and Cost Estimates,
W76-08703 5D

ADVECTION
Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

AERATED LAGOON
Treatment of Tannery Wastewater from Bona Allen, Inc., Buford, Georgia,
W76-08177 5D

AERATION
Waste Treatment and Control at Live Oak Poultry Processing Plant,
W76-08185 3E

Combined Treatment of Leather Tanning and Municipal Wastes at Grand Haven, Michigan,
W76-08294 5D

Oxygen, and Other Innovations, Help Lick Tough Waste Problem,
W76-08715 5D

AERIAL PHOTOGRAPHY
Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

AEROBIC TREATMENT
Rum Distillery Wastes: Laboratory Studies on Aerobic Treatment,
W76-08469 5D

AGGREGATION INDICES (ORGANISMS)
Method of Studying the Spatial Distribution of Organisms, (In Russian),
W76-08176 7B

AGRICULTURAL RUNOFF
A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

AGRICULTURAL WATERSHEDS
An Optimization Technique Adapted to USDAHL-74 Revised Model of Watershed Hydrology,
W76-08523 2A

Watershed Soil Detachment and Transportation Factors,
W76-08551 2J

Water Quality in Irrigated Watersheds,
W76-08679 5B

AIR BUBBLERS
Status of Air Bubble Fish Protection System at Indian Point Station on the Hudson River,
W76-08657 8I

AIR POLLUTION
Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

AIR POLLUTION EFFECTS
The Significance and Variation of Atmospheric Nutrient Inputs in a Small Catchment System,
W76-08728 5A

AIR TEMPERATURE
On a Thermal Lag in the North Atlantic Ocean During a Climatic Change,
W76-08127 2L

ALABAMA
Water Resources Planning for Rivers Draining into Mobile Bay, Part II: Non-Conservative Species Transport Models,
W76-08327 5B

Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

ALASKA
Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

Oceanographic Conditions During 1973 in Russel Fjord, Alaska,
W76-08525 2L

Channel Erosion Surveys Along Taps Route, Alaska, 1974,
W76-08559 2J

The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

Effects of Forest Fertilization on Two Southeast Alaska Streams,
W76-08673 5B

The Nitrogen Balance of Arctic Tundra: Pathways, Rates, and Environmental Implications,
W76-08678 5B

ALGAE
Biological Problems of a Manmade Small Lake, (In German),
W76-08107 5C

Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

Effect of Crude Oil on Populations of Bacteria and Algae in Artificial Ponds Subject to Winter Weather and Ice Formation,
W76-08453 5C

Effects of Condenser Entrainment on Algal Photosynthesis at Mid-Atlantic Power Plants,
W76-08637 5C

ALGAL ASSAY
Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

ALGAL TOXINS
Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

ALGORITHMS
Load and Voltage Control Algorithms for Grand Coulee Powerplant,
W76-08112 8C

Economic Evaluation of Proposed Water Conservation Practices on Established Irrigation Districts: A General Methodology and Application to Three Districts in Oregon,
W76-08431 3F

ALTERNATIVE PLANNING
Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

ALUMINUM
Clearing of Titanium- and Aluminium-Containing Effluent Waters.
W76-08708 5D

AMERICAN SHAD
Weight Loss, Mortality, Feeding, and Duration of Residence of Adult American Shad, Alosa Sapidissima in Fresh Water,
W76-08433 5C

AMERICIUM
Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

A Procedure for Analysis of Amercium in Marine Environmental Samples,
W76-08611 5A

AMINO ACIDS
Amino Acids and Gases in Some Springs and an Oil Field in California,
W76-08568 4B

AMMONIA NITROGEN
Measurement Method for Dissolved Ammonia Nitrogen in Water (Yozon anmoniasei chisso nodo sokuteiho),
W76-08261 5A

AMPHIPODA
Research Studies on the Fauna of the Greek Subterranean Waters, (In French),
W76-08296 2L

AMPIPHODA
Ecology and Prospects of Using the Amphipod Gammarus (R.) Balcanicus Schaef, (In Russian),
W76-08410 2I

ANADROMOUS FISH
Weight Loss, Mortality, Feeding, and Duration of Residence of Adult American Shad, Alosa Sapidissima in Fresh Water,
W76-08433 5C

ANAEROBIC DIGESTION
Methane Fermentation of Rubber (Hevea Brasiliensis) Latex Effluent,
W76-08722 5D

ANALYTICAL TECHNIQUES
Evaluation of Methods for Preserving the Levels of Soluble Inorganic Phosphorus and Nitrogen in Unfiltered Water Samples,
W76-08157 5A

Detection of Salts of 2,4-D in Aqueous Solution by Laser Raman Spectroscopy,
W76-08254 5A

An Improved Method for Determination of the Chemical Oxygen Demand with Potassium Dichromate (Cod-Method) (Eine Verbesserte Methode zur Bestimmung des Chemischen Sauerstoffbedarfs mit Kaliumdichromat) (Cod-Methode),
W76-08256 5A

Alternative Methods of Estimating Snow Water Parameters,
W76-08259 2C

Absorptiometric Determination of Iron with T.P.T.Z.,
W76-08273 5A

Simultaneous Determination of Cu2+, Pb2+, Cd2+, and Zn2+ in Fresh Town-Water by Anodic Stripping Polargraphy, (In Japanese),
W76-08275 5A

A Continuous Method of Monitoring Water Quality by Chlorine Consumption Under Ultraviolet Radiation. I. Design and Performance Test of Continuous Chlorine Consumption Meter and Application to Raw Waters of A Water Purification Plant, (In Japanese),
W76-08276 5A

Numerical Computation of Two-Dimensional Flows,
W76-08341 2L

Determination of Total Nitrogen in Natural Waters,
W76-08355 2K

The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

Design of Ground-Water Level Observation Network.
W76-08563 4B

Effect of Solar Energy and Water on Plant Productivity (In Bulgarian),
W76-08576 2I

Reference Methods for Marine Radioactivity Studies II.
W76-08608 5A

A Procedure for Analysis of Amercium in Marine Environmental Samples,
W76-08611 5A

Results of Plutonium Intercalibration in Seawater and Seaweed Samples,
W76-08616 5A

A Review of Methods for the Determination of Radioactive and Stable Silver in the Marine Environment,
W76-08621 5A

A Review of Methods for the Determination of Iodine-131 in the Marine Environment,
W76-08622 5A

A Rapid Method for the Determination of Radioiodine in Suspended Matter and Seawater,
W76-08623 5A

ANCHORAGE AREA (ALASKA)
The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

ANEMIA
Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

ANNELIDS
The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

ANODIC STRIPPING POLARGRAPHY
Simultaneous Determination of Cu2+, Pb2+, Cd2+, and Zn2+ in Fresh Town-Water by Anodic Stripping Polargraphy, (In Japanese),
W76-08275 5A

APPALACHIAN MOUNTAIN REGION
Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

AQUACULTURE
Culture and Growth of Northern Anchovy, Engraulis Mordax Larvae,
W76-08432 2L

AQUATIC ANIMALS
Theoretical Bases of Modelling of Populations and Communities of Aquatic Animals,
W76-08214 8I

Abstract Models of Communities of Aquatic Animals,
W76-08218 8I

Introduction to Hydrobiology. Hydrobiology: A Compendium for Engineers and Natural Scientists, (In German),
W76-08315 5C

A Simple Continuous-Flow Respirometer for Comparative Respiratory Changes in Medium-Sized Aquatic Organisms,
W76-08353 5C

AQUATIC BACTERIA
Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

AQUATIC ENVIRONMENT
Chemistry and Effects of Chlorine in Aquatic Systems, A Selected, Annotated Bibliography,
W76-08592 5C

Plutonium in the Aquatic Environment, Its Behaviour, Distribution and Significance,
W76-08599 5C

Plutonium in Atlantic Coastal Estuaries in the Southeastern United States of America,
W76-08600 5C

AQUATIC LIFE
Savannah River Biological Survey, Lower Three Runs.
W76-08593 5C

Savannah River Biological Survey.
W76-08594 5C

AQUATIC VEGETATION
Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

AQUIFER TESTING
Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case,
W76-08124 2F

AQUIFERS
Transient Aquifer Flows by Characteristics Method,
W76-08513 2F

Improved Image-Well Technique for Aquifer Analysis,
W76-08517 4B

Dynamic Response of Aquifer Systems to Localized Recharge,
W76-08520 2F

ARCHING
Arching of Fragmented Ice Covers,
W76-08149 2C

ARCTIC
Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

ARCTIC ECOSYSTEMS
The Nitrogen Balance of Arctic Tundra: Pathways, Rates, and Environmental Implications,
W76-08678 5B

ARIZONA
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

Multiple Use Evaluations on Ponderosa Pine Forest Land,
W76-08109 4A

Pinyon-Juniper Control--Does it Pay,
W76-08110 4A

Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

Water Use by Saltcedar as Measured by the Water Budget Method,
W76-08573 2D

ARKANSAS
Flood Plain Information: Saline River and Tributaries, Benton, Arkansas.
W76-08389 4A

ARKANSAS RIVER
Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

AROMATIC POLYESTER MEMBRANES
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

ARTIFICIAL LAKES
Biological Problems of a Manmade Small Lake, (In German),
W76-08107 5C

ARTIFICIAL PRECIPITATION
Particle Vaporizer,
W76-08148 3B

ARTIFICIAL RECHARGE
Artificial-Recharge Experiments in the Alluvial Aquifer South of Fountain, El Paso County, Colorado,
W76-08571 4B

ASIA
Rainfall and Floods in India During 1974 Southwest Monsoon Period,
W76-08732 2B

ASPIUS-ASPIUS
Age Composition and Growth of Aspius Aspius (L.) in the Lower Volga, (In Russian),
W76-08255 2I

ASSESSMENT
Reassessment of the Cross-Florida Barge Canal: A Probability Approach,
W76-08228 4A

ATLANTIC COASTAL PLAIN
Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

ATLANTIC OCEAN
On a Thermal Lag in the North Atlantic Ocean During a Climatic Change,
W76-08127 2L

Distribution of Chaetognatha and Biomass of the Zooplankton in the Western Part of the Tropical Atlantic, During July and August 1968, (In Spanish),
W76-08245 2L

Mercury Concentrations in Fish, North Atlantic Offshore Waters--1971,
W76-08360 5A

ATMOSPHERE
Laser Applications to Atmospheric Sciences - A Bibliography,
W76-08323 10C

ATMOSPHERIC NUTRIENTS
The Significance and Variation of Atmospheric Nutrient Inputs in a Small Catchment System,
W76-08728 5A

ATRAZINE
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

ATTITUDES
The Water Pollution Control Act of 1972 Institutional Assessment, Attitudes of Participants.
W76-08221 5G

Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

AUGUSTA CREEK (MICH)
The Relationship Between Watershed Use and Stream Water Quality,
W76-08282 4D

AUSTRALIA
Two-Dimensional Mathematical Water Quality Model,
W76-08135 5B

An Assessment of Eutrophication in Australian Inland Waters,
W76-08162 5C

Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

Effects of Hydrologic Regime on Magnitude and Frequency of Dominant Discharge,
W76-08514 2E

AUTOMATIC CONTROL
Economical Foam Control in Wastewater Treatment Systems,
W76-08249 5D

New Automation Improves Sacramento Wastewater Control,
W76-08264 5D

Zero Effluent System.
W76-08267 5D

AUTOMATIC DATA COLLECTION
Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

AUTOMATION
Water Treatment Untouched by Human Hands - Almost,
W76-08266 5F

AZOTOBACTER
Effect of Crude Oil on Populations of Bacteria and Algae in Artificial Ponds Subject to Winter Weather and Ice Formation,
W76-08453 5C

BACTERIA
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

Food Habit of Vorticellidae Isolated From Activated Sludge,
W76-08309 5D

Role of Vitamins in Bacterial-Plankton Relationships in Littoral Seawater and in Supralittoral Pools: II. Annual Evolution of Organisms Which Produce Vitamin Synthesis, (In French),
W76-08405 5C

Effect of Crude Oil on Populations of Bacteria and Algae in Artificial Ponds Subject to Winter Weather and Ice Formation,
W76-08453 5C

Purifying-Demicrobising Waste-Water.
W76-08705 5D

BACTERICIDES
Demand Bactericide for Disinfecting Water and Process of Preparation,
W76-08391 5D

BALTIC SEA
The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

BANK EROSION
Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

BARRIERS
Fast Current Oil Control Study,
W76-08748 5G

BASE FLOW
The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

BASELINE STUDIES
Water Quality in the Mad River Basin, Humboldt and Trinity Counties, California,
W76-08562 5A

Savannah River Biological Survey, Lower Three Runs.
W76-08593 5C

Savannah River Biological Survey.
W76-08594 5C

Chlorinated Hydrocarbon Pesticides and Mercury in Coastal Biota, Puerto Rico and the U.S. Virgin Islands--1972-74,
W76-08683 5B

Baseline Concentrations of Polychlorinated Biphenyls and DDT in Lake Michigan Fish, 1971,
W76-08685 5A

BASIC DATA COLLECTIONS
Water Resources Data for California, 1974: Part 1. Surface Water Records--Volume 2: Northern Great Basin and Central Valley.
W76-08556 7C

Selected Hydrologic Data, Chester County, Pennsylvania,
W76-08557 7C

Data on Selected Lakes in Washington, Part 3,
W76-08564 2H

BASINS
The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

BATHYMETRY
Lake Erie and Its Basin,
W76-08723 2H

BAYS
Water Resources Planning for Rivers Draining into Mobile Bay, Part II: Non-Conservative Species Transport Models,
W76-08327 5B

Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

Distribution and Movement of Zinc and Other Heavy Metals in South San Francisco Bay, California,
W76-08561 5B

BEACHES
Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

BEDFORD BASIN (NOVA SCOTIA)
Nitrogen Utilization During Spring Blooms of Marine Phytoplankton in Bedford Basin, Nova Scotia, Canada,
W76-08691 5C

BEDROCK
Lake Erie and Its Basin,
W76-08723 2H

BEET PEELING SYSTEM
Libby, McNeill Solves an Odor Problem,
W76-08502 5D

BENTHOS
Energy Content of the Benthos and Epifauna in the Pongola River, Natal, (In Afrikaans),
W76-08158 2I

The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

BENTONITE
Evaluation of Bentonite Clay for Waterproofing Foundation Walls Below Grade,
W76-08427 8D

BIBLIOGRAPHIES
Laser Applications to Atmospheric Sciences - A Bibliography,
W76-08323 10C

BIBLIOGRAPHY
Chemistry and Effects of Chlorine in Aquatic Systems, A Selected, Annotated Bibliography,
W76-08592 5C

BIO-ACCUMULATION
Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

BIO-FILTER
The Role of High Rate Bio-Filters in the Leather Industry,
W76-08180 5D

BIOACCUMULATION
Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

BIOASSAY
Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

BIOCHEMICAL OXYGEN DEMAND
Self-Purification Capacity of Impoundments,
W76-08358 5C

Reverse Osmosis System Corrects High BOD Wastes: Yields Net Operating Savings,
W76-08486 5D

Distributions of BOD and Do In Rivers and Lakes,
W76-08743 5B

BIOCHEMISTRY
Biochemical Studies of Entrained Phytoplankton at the Morgantown Maryland Power Plant,
W76-08642 5C

BIODEGRADATION
Determination of Biological Degradability of Organic Substances,
W76-08351 5B

Purifying-Demicrobising Waste-Water.
W76-08705 5D

BIOINDICATORS
Note on the Distribution of Mercury in Fish Species in Three Ohio Lakes,
W76-08441 5C

BIOLOGICAL COMMUNITIES
Development Trends in Methods used to Model Populations and Communities,
W76-08212 8I

Development Trends in Methods Used to Model Populations and Communities,
W76-08213 8I

Theoretical Bases of Modelling of Populations and Communities of Aquatic Animals,
W76-08214 8I

Abstract Models of Communities of Aquatic Animals,
W76-08218 8I

BIOLOGICAL DIVERSITY
Natural and Agricultural Ecosystems,
W76-08667 6G

BIOLOGICAL TREATMENT
O2 Injection Doubles/Triples Biological Waste Treatment Activity.
W76-08167 5D

A New Sewage Treatment Technique for the Purpose of Nitrogen Elimination (I): Biological Denitrogenization of Urban Sewage (Chisso jokyo o mokuteki to shite atarashii gesui shori gijutsu (I),--Toshi gesui kara no seibutsugakuteki datsu chissoho ni tsuite),
W76-08274 5D

Biological Processes for Effluent and Waste Treatment Exemplified by the Paper Industry (Biologische Verfahren Zur Abwasser- Und Abfallaufbereitung am Beispiel der Paper-Industrie),
W76-08699 5D

BIOMASS
Marine Ecology of the Northern Euboea: I. Preliminary Data on the Zooplankton and the Ichtyoplankton, (In French),
W76-08106 2L

Distribution of Chaetognatha and Biomass of the Zooplankton in the Western Part of the Tropical Atlantic, During July and August 1968, (In Spanish),
W76-08245 2L

Ecology of the Zooplankton in the Gulf of Cariaco. Part I: Variability of the Biomass of the Zooplankton During the Period from August to November, 1973, (In Spanish),
W76-08247 5C

Phytoplankton in Northern Donetsk Ponds for Additional Treatment, (In Ukranian),
W76-08577 5C

Abundance and Biomass of Bacterioplankton of 'Tastaka' Ponds, (In Russian),
W76-08664 5C

BIOMPHALARIA GLABRATA
Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

BIOTA
Distributions of Transuranium Nuclides in Sediment and Biota of the North Atlantic Ocean,
W76-08602 5B

Chlorinated Hydrocarbon Pesticides and Mercury in Coastal Biota, Puerto Rico and the U.S. Virgin Islands--1972-74,
W76-08683 5B

BLACK SEA AREA
The Effect of Forest Stands on the Water Content of Rocks of the Loess Cover in the Western Regions of the Northern Black Sea Area, (In Ukranian),
W76-08303 4A

BLEACHING
The Long Hard Road to the Effluent-Free Pulp Mill,
W76-08698 5D

BLOOD CHEMISTRY
Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

BLOOD RECOVERY
Utilisation of Blood,
W76-08166 3E

BLUE CRAB
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

BODIES OF WATER
Fan Disturbing Sand at the Bottom of a Body of Water so That it May be Pumped up Efficiently,
W76-08205 8C

BOGS
On the Occurrence of Pressure Water in Low Bogs, (In German),
W76-08105 2H

The Effect of Mineral Environment on the Geohydrological Situation in Low Bog Sites, (In German),
W76-08184 2H

BOMBAY HARBOR BAY (INDIA)
Plutonium in the Aquatic Environment, Its Behaviour, Distribution and Significance,
W76-08599 5C

BORON
Transfer of Boron and Tritiated Water Through Sandstone,
W76-08547 5B

BOTTOM SEDIMENTS
An Ignition Method for Determination of Total Phosphorus in Lake Sediments,
W76-08346 5A

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

Distribution and Movement of Zinc and Other Heavy Metals in South San Francisco Bay, California,
W76-08561 5B

BOUNDARIES (SURFACES)
Improved Image-Well Technique for Aquifer Analysis,
W76-08517 4B

BOUNDARY LAYER RESISTANCE
Great Plains Evapotranspiration by a Resistance Model Using Remotely Sensed Thermal Imagery,
W76-08585 2D

Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

An Evaluation of a Resistance Form of the Energy Balance to Estimate Evapotranspiration,
W76-08587 2D

BOUNDARY PROCESSES
Channel Flow Over Permeable Beds of Graded Spheres,
W76-08511 8B

BRAZORIA COUNTY (TEX)
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

BREAKWATERS
Field Performance of Permeable Breakwater,
W76-08684 8A

BROWN SHRIMP
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

BROWN TROUT
Studies on the Host Specificity of the Eyefluke Diplostomum Spathaceum, in Brown and Rainbow Trout,
W76-08302 5C

BRYOZOANS
Sessile Animals on Tar Globules in the Waters Around the Ryukyu Islands, (In Japanese),
W76-08232 2L

BUOYANT JET
Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

BUSHFIRE
Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

BY-PRODUCTS
Utilisation of Blood,
W76-08166 3E

Paunch Handling and Processing Techniques,
W76-08173 3E

Changing Hog Hair from Costly Nuisance to Asset.
W76-08297 5D

BYPRODUCTS
Ims-Grangcold Pelletizing System for Steel Mill Wastes Material,
W76-08491 5D

CADMIUM
A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

CALIBRATION
Results of Plutonium Intercalibration in Seawater and Seaweed Samples,
W76-08616 5A

CALIFORNIA
Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

Flood Plain Information: Alamo and Ulatis Creeks, Vacaville, California.
W76-08377 4A

Flood Plain Information: Eel River--Stafford to Holmes, Humboldt County, California,
W76-08378 4A

Flood Plain Information: San Felipe Lake, Pacheco Creek, San Benito County, California.
W76-08379 4A

Flood Plain Information: San Antonio Creek and Tributaries, Vicinity of OJAI, Ventura County, California.
W76-08380 4A

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

Rate of Chloride and Water Movement in Southern California Soils,
W76-08545 2G

Water Resources Data for California, 1974: Part 1. Surface Water Records--Volume 2: Northern Great Basin and Central Valley.
W76-08556 7C

Distribution and Movement of Zinc and Other Heavy Metals in South San Francisco Bay, California,
W76-08561 5B

Water Quality in the Mad River Basin, Humboldt and Trinity Counties, California,
W76-08562 5A

Amino Acids and Gases in Some Springs and an Oil Field in California,
W76-08568 4B

Transient Water Quality Modeling in Streams,
W76-08730 5B

CANADA
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

Sewage Cleaned with Coal,
W76-08263 5D

Canadian Milling Practice for Water Re-Use,
W76-08272 5D

Behaviour of Oil Under Canadian Climatic Conditions. Part 1. Oil on Water Under Ice-Forming Conditions,
W76-08365 5B

The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

Sediment Yields and Nutrient Loadings from Canadian Watersheds Tributary to Lake Erie: An Overview,
W76-08529 5B

Nitrogen Utilization During Spring Blooms of Marine Phytoplankton in Bedford Basin, Nova Scotia, Canada,
W76-08691 5C

CANALS
Reassessment of the Cross-Florida Barge Canal: A Probability Approach,
W76-08228 4A

CANNERIES
Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

CANOPY INTERCEPTION
Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

CANOPY TEMPERATURE
Great Plains Evapotranspiration by a Resistance Model Using Remotely Sensed Thermal Imagery,
W76-08585 2D

CAPITELLA SP.
The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

CARBOHYDRATES
Carbohydrate Transformation in Wheat and Rye Plants Under Effect of Flooding in the Autumn-Winter Period, (In Russian),
W76-08307 3F

CARBON
Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

CARBON DIOXIDE
Effect of Solar Energy and Water on Plant Productivity (In Bulgarian),
W76-08576 2I

CARP
Toxic Action of Copper on the Gills of Carp (Cyprinus Carpio), (In French),
W76-08260 5C

Note on the Distribution of Mercury in Fish Species in Three Ohio Lakes,
W76-08441 5C

Survival Rate of Starving Carp (Cyprinus Carpio Linne), (In Russian),
W76-08552 5C

Role of Far Eastern Herbivorous Fish in Ecosystems of Natural Water Bodies Used for Acclimatization, (In Russian),
W76-08666 5C

CATFISHES
An Experiment on the Feeding of Fry of Catfish Heteropneustes Fossilis,
W76-08575 2I

CATION EXCHANGE
Fundamental Aspects of Erosion of Cohesive Soils,
W76-08540 2J

CELL SAP ACTIVITY
Relation Between Plant Transpiration and Metabolism, (In Russian),
W76-08583 2D

CELLULOSE
Treatment of Effluent.
W76-08488 5D

CELLULOSE TRIACETATE MEMBRANES
Development of Assymmetric Cellulose Triacetate Membranes for Seawater Desalination,
W76-08283 3A

CENTRIFUGATION
Studies Concerning Oil Removal from Mill Scale (Untersuchungen Zur Entoelung Von Walzzunder),
W76-08707 5D

CERIUM
A Study of the Stability of Some Radionuclides in Seawater,
W76-08625 5A

CESIUM
Evaluation of Mineralization Processes for SRP Wastes,
W76-08595 5G

CHAD (LAKE CHAD)
The Selection of Prey in 3 Malacophagous Fishes of Lake Chad, (In French),
W76-08178 2H

CHAETOGNATHA
Distribution of Chaetognatha and Biomass of the Zooplankton in the Western Part of the Tropical Atlantic, During July and August 1968, (In Spanish),
W76-08245 2L

CHANNEL CATFISH
Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

CHANNEL EROSION
Channel Erosion Surveys Along Taps Route, Alaska, 1974,
W76-08559 2J

CHANNEL FLOW
Momentum Transfer in Hydrodynamically Developing Laminar Flow in a Straight Channel,
W76-08318 8B

CHANNEL IMPROVEMENT
Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

CHANNELS
Simulation of Hydraulic Processes in Open Channels,
W76-08344 8B

CHEMICAL ANALYSIS
Selected Hydrologic Data, Chester County, Pennsylvania,
W76-08557 7C

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

CHEMICAL CLARIFICATION
Chemical Clarification of Waste Water.
W76-08702 5D

CHEMICAL INDUSTRY
Capabilities and Costs of Technology for the Organic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08188 5G

Capabilities and Costs of Technology for the Inorganic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08189 5G

Settling Tank,
W76-08495 5D

Removing Fine Plastic Particles From Waste Water.
W76-08497 5D

CHEMICAL OXYGEN DEMAND
An Improved Method for Determination of the Chemical Oxygen Demand with Potassium Dichromate (Cod-Method) (Eine Verbesserte Methode zur Bestimmung des Chemischen Sauerstoffbedarfs mit Kaliumdichromat) (Cod-Methode),
W76-08256 5A

CHEMICAL PRECIPITATION
Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

Protein and Fat Recovery from Effluents,
W76-08172 5D

Chemical Clarification of Waste Water.
W76-08702 5D

Fluoride Removal: Technology and Cost Estimates,
W76-08703 5D

Clearing of Titanium- and Aluminium-Containing Effluent Waters.
W76-08708 5D

CHEMICAL PROPERTIES
Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

CHEMICAL REACTIONS
Interaction of Plutonium with Complexing Substances in Soils and Natural Waters,
W76-08605 5B

CHEMICAL TREATMENT
Chemical Clarification of Waste Water.
W76-08702 5D

CHEMICAL WASTES
Capabilities and Costs of Technology for the Organic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08188 5G

Solid Mineral and Regenerant Recovery for Ion-Exchange Resins,
W76-08199 3A

Process for the Environmentally Favorable Destruction of Solid and/or Liquid Cyanide Waste,
W76-08208 5D

Removing Heavy Metal Ions from Water,
W76-08401 5D

New Incineration Method Solves Grease Problem in Richmond, Pa.,
W76-08485 5E

Clearing of Titanium- and Aluminium-Containing Effluent Waters.
W76-08708 5D

Industry Takes the Lead in Cleaning Up the Rhine.
W76-08713 5D

Cleaning of Industrial Effluent,
W76-08719 5D

Re-Use and Disposal of Waste Acids,
W76-08721 5D

CHEMISTRY
Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

CHERRY CREEK WATERSHED (MD)
Preparation of Plans and Specifications for Pollution Abatement Activities in Cherry Creek Watershed, Maryland.
W76-08385 5G

CHESAPEAK BAY
Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

CHESTER COUNTY (PA)
Selected Hydrologic Data, Chester County, Pennsylvania,
W76-08557 7C

CHILLER WATER
Recycling of Water in Poultry Processing Plants,
W76-08298 3E

CHITOSAN
Coagulation with Chitosan - An Aid to Recovery of By-Products from Egg Breaking Wastes,
W76-08289 5D

CHLORATES
Process for Purification of Industrial Waste Waters from Perchlorates and Chlorates,
W76-08395 5D

CHLORIDE MOVEMENT
Rate of Chloride and Water Movement in Southern California Soils,
W76-08545 2G

CHLORIDE TRANSPORTS
Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

CHLORIDES
The Control of Chloride Ions in the MgO Recovery System,
W76-08457 5D

Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

Rate of Chloride and Water Movement in Southern California Soils,
W76-08545 2G

CHLORINATED HYDROCARBON PESTICIDES
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

Chlorinated Hydrocarbon Pesticides and Mercury in Coastal Biota, Puerto Rico and the U.S. Virgin Islands--1972-74,
W76-08683 5B

CHLORINATION
Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

Entrainment Studies on Hudson River Organisms,
W76-08633 5C

CHLORINE
Chemistry and Effects of Chlorine in Aquatic Systems, A Selected, Annotated Bibliography,
W76-08592 5C

CHROMIUM RECOVERY
Report on Methods of Chrome Recovery and Reuse from Spent Chrome Tan Liquor,
W76-08174 5D

CHROMIUM REMOVAL
Trivalent Chromium in Tannery Effluents,
W76-08295 5D

CIRCULATION
Steady Stratified Circulation in a Cavity,
W76-08136 2H

Suspended Material Transport: Narragansett Bay Area, Rhode Island,
W76-08139 2L

CIRCULATION PATTERN
Suspended Material Transport: Narragansett Bay Area, Rhode Island,
W76-08139 2L

CLAY LOAM
Thermal Properties of Fine Textured Mollisols Under Varying Moisture Conditions,
W76-08364 2G

CLAYS
Properties of Expansive Clay Soils; Report 2, A Numerical Procedure for Predicting Heave with Time,
W76-08420 8D

Artificially Simulating the Geological History of Clay,
W76-08421 8D

Soil Stabilization with Powdered and Coarse Quicklime,
W76-08422 8D

Earth Pressure Observations on a Retaining Wall in Expansive Clay, Gougher Street Mail Exchange, Adelaide,
W76-08424 8D

Evaluation of Bentonite Clay for Waterproofing Foundation Walls Below Grade,
W76-08427 8D

CLEANING
Cleaning of Industrial Effluent,
W76-08719 5D

CLIMATOLOGY
Particle Vaporizer,
W76-08148 3B

A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

CLOUD SEEDING
Research and Development of an Airborne Hygroscopic Spray System,
W76-08111 3B

Particle Vaporizer,
W76-08148 3B

Design of an Experiment to Suppress Hail in Illinois,
W76-08330 3B

The Responses of Soils and Soil Microorganisms to Silver Iodide Weather Modification Agents,
W76-08670 2G

COAGULATION
Acid Coagulation and Dissolved Air Flotation,
W76-08224 5D

Coagulation with Chitosan - An Aid to Recovery of By-Products from Egg Breaking Wastes,
W76-08289 5D

Biological Changes in the South St. Paul Sewage Treatment Plant Before and After Treatment with FeCl3 and Nalcolyte 675 Coagulating Agents,
W76-08290 5D

COAL MINE WASTES
Preparation of Plans and Specifications for Pollution Abatement Activities in Cherry Creek Watershed, Maryland.
W76-08385 5G

Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

COALS
Sewage Cleaned with Coal,
W76-08263 5D

COASTAL AQUIFERS
Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

COASTAL ENGINEERING
Numerical Computation of Two-Dimensional Flows,
W76-08341 2L

Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

COASTAL STRUCTURES
Field Performance of Permeable Breakwater,
W76-08684 8A

COASTS
Ekman Veering Observed Near the Ocean Bottom,
W76-08129 2L

Some Three-Dimensional Characteristics of Low-Frequency Current Fluctuations Near the Oregon Coast,
W76-08336 2L

COD
The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

COHESIONLESS SOILS
Improvement of Core Drill Methods,
W76-08419 8D

COHESIVE SOILS
Fundamental Aspects of Erosion of Cohesive Soils,
W76-08540 2J

COHO SALMON
Electrophysiological Studies of Morpholine-Imprinted Coho Salmon (Oncorhynchus Kisutch) and Rainbow Trout (Salmo Gairdneri),
W76-08438 5C

Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

COLD REGIONS
Behaviour of Oil Under Canadian Climatic Conditions. Part 1. Oil on Water Under Ice-Forming Conditions,
W76-08365 5B

Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

COLD RESISTANCE
The State of Water in Plant Tissues at Negative Temperatures under Natural Conditions, (In Russian),
W76-08368 2I

COLIFORMS
Shooting Models for Salinity and Coliform,
W76-08134 5B

COLLECTING TECHNIQUE
An Aquatic Technique for Collecting Small Adult Insects,
W76-08574 7B

COLOR
Treatment of Dye Wastes with Granular Activated Carbon,
W76-08716 5D

Cleaning of Industrial Effluent,
W76-08719 5D

COLORADO
Flood Plain Information: Purgatoire River and Tributaries, Vicinity of Trinidad, Colorado.
W76-08381 4A

Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

Flood Plain Information: Colorado River and Rifle, Government, Hubbard Gulch Creeks, Rifle, Colorado.
W76-08390 4A

Artificial-Recharge Experiments in the Alluvial Aquifer South of Fountain, El Paso County, Colorado,
W76-08571 4B

COLORADO RIVER
Flood Plain Information: Colorado River and Rifle, Government, Hubbard Gulch Creeks, Rifle, Colorado.
W76-08390 4A

COLUMBIA RIVER
Distribution, Composition, and Transport of Suspended Particulate Matter in the Vicinity of Willapa Submarine Canyon, Washington,
W76-08737 2L

COMBINED TREATMENT
Municipal Industrial Waste Program Nets $8.9 Million in Two Years.
W76-08712 5D

Industry Takes the Lead in Cleaning Up the Rhine.
W76-08713 5D

Austrian Experiences Concerning Damages of Communal Purification Facilities by Industrial Effluents (Osterreichische Erfahrungen Betreffend Schaden an Kommunalen Klaranlagen Durch Industrieabwasser).
W76-08714 5D

Oxygen, and Other Innovations, Help Lick Tough Waste Problem,
W76-08715 5D

COMMERCIAL FISH
Weight Loss, Mortality, Feeding, and Duration of Residence of Adult American Shad, Alosa Sapidissima in Fresh Water,
W76-08433 5C

Effects of Temperature and Salinity on the Survival of Winter Flounder Embryos,
W76-08437 5C

COMMERCIAL SHELLFISH
Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

COMMON DUCKWEED
Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

COMPRESSIVE STRENGTH
Soil Stabilization with Powdered and Coarse Quicklime,
W76-08422 8D

COMPUTATION
Dimensionless Solution of Dam-Break Flood Waves,
W76-08343 8B

COMPUTER MODELS
Two-Dimensional Mathematical Water Quality Model,
W76-08135 5B

Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

An Optimization Technique Adapted to USDAHL-74 Revised Model of Watershed Hydrology,
W76-08523 2A

Impact of Remote Sensing Upon the Planning, Management, and Development, and Development of Water Resources,
W76-08536 6B

Implementation of Hydrologic Models at Goddard Space Flight Center.
W76-08745 2A

COMPUTER PROGRAMS
Estimation by Digital Computer of the Drawdown Caused by Groundwater Withdrawal,
W76-08140 4B

Dynamic Response of Aquifer Systems to Localized Recharge,
W76-08520 2F

COMPUTERS
Models of Actual Fish Populations,
W76-08216 8I

CONCRETE DAMS
Nonlinear Earthquake Response of Concrete Gravity Dams,
W76-08426 8F

CONDUCTIVITY
Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

CONDUITS
Combination Sewage Treatment and Cooling System,
W76-08242 5D

CONFERENCES
International Association of Engineering Geology, Proceedings of the Second International Congress, Volume I.
W76-08417 8D

International Association of Engineering Geology, Proceedings of the Second International Congress, Volume 2.
W76-08418 8E

Transuranium Nuclides in the Environment.
W76-08597 5C

Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop.
W76-08628 8I

CONNECTICUT RIVER
Examination of the Concept and Use of the Standard Project Flood,
W76-08321 8B

Vulnerability and Survival of Young Connecticut River Fish Entrained at a Nuclear Power Plant,
W76-08656 8I

CONSOLIDATION
Artificially Simulating the Geological History of Clay,
W76-08421 8D

CONSTRUCTION
Polyethylene Pipe Solves Problem of Force Main Sewer Line Installation Across Inland Waterway.
W76-08236 8F

Half-Section Pipe Used Effectively,
W76-08237 8F

Channel Erosion Surveys Along Taps Route, Alaska, 1974,
W76-08559 2J

CONSTRUCTION COSTS
Water Pollution Control Act of 1972, Institutional Assessment, Construction Grants.
W76-08194 5G

An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

CONSTRUCTION GRANTS
Water Pollution Control Act of 1972, Institutional Assessment, Construction Grants.
W76-08194 5G

CONTINENTAL SHELF
A Seabed Drifter Study of Near-Bottom Circulation in North Carolina Shelf Waters,
W76-08350 2L

CONTINENTAL SLOPE
Distribution, Composition, and Transport of Suspended Particulate Matter in the Vicinity of Willapa Submarine Canyon, Washington,
W76-08737 2L

COOK INLET (ALASKA)
Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

COOLING
Combination Sewage Treatment and Cooling System,
W76-08242 5D

COOLING TOWERS
Waste Water Recycled For Use in Refinery Cooling Towers,
W76-08270 5D

COOLING WATER
Zooplankton Survival in Cooling Water Systems of Four Thermal Power Plants on the California Coast-Interim Report. March 1971-January 1972,
W76-08630 5C

A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part I: Model Studies and Fouling Control Techniques,
W76-08660 8I

COPEPODS
Research Studies on the Fauna of the Greek Subterranean Waters, (In French),
W76-08296 2L

COPPER
Toxic Action of Copper on the Gills of Carp (Cyprinus Carpio), (In French),
W76-08260 5C

COPPER ETCHING WASTES
Process for the Electrolytic Reclamation of Spent Etching Fluids,
W76-08471 5D

COPPER SULFATE
Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

COPPER UPTAKE RATE
Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

CORALVILLE RESERVOIR (IOWA)
Coralville Water Quality Study, Annual Report, Water Year October 1, 1974 to September 30, 1975,
W76-08324 5A

CORE DRILLING
Improvement of Core Drill Methods,
W76-08419 8D

CORN
Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

CORN (FIELD)
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

CORRELATION ANALYSIS
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

Interstation Correlation of Peak-Flow Estimates,
W76-08555 4A

CORROSION CONTROL
The Control of Chloride Ions in the MgO Recovery System,
W76-08457 5D

CORTISOL
Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

COST ANALYSIS
Water Pollution Abatement Technology: Capabilities and Costs, Urban Runoff.
W76-08222 5G

COST-BENEFIT ANALYSIS
Reassessment of the Cross-Florida Barge Canal: A Probability Approach,
W76-08228 4A

COSTS
What Does a 'Clean' Environment Cost,
W76-08150 5G

Control of Acid Mine Drainage.
W76-08156 5G

Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

Capabilities and Costs of Technology for the Organic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08188 5G

Capabilities and Costs of Technology for the Inorganic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08189 5G

Water Pollution Abatement Technology: Costs and Capabilities Petroleum Refining Industry, Part 1, Chapters -V.
W76-08190 5G

Water Pollution Abatement Technology: Costs and Capabilities, Petroleum Refining Industry, Part 2, Chapters VI - IX.
W76-08191 5G

Development of Storm Drainage Cost Functions,
W76-08227 3D

Municipal Industrial Waste Program Nets $8.9 Million in Two Years.
W76-08712 5D

COURANT NUMBER
Numerical Computation of Two-Dimensional Flows,
W76-08341 2L

COVER CROPS
A Brief Characterization of Shoals and Their Plant Cover in the Kremenchug Reservoir, (In Russian),
W76-08697 2H

CRAB EGGS
Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

CRABS
Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

CROP PRODUCTION
Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

CROP TEMPERATURE
Canopy Temperature Measurement of Sorghum and Millet with Leaf Thermocouple and Infrared Thermometer Techniques,
W76-08590 2D

Thermal Scanner Measurements of Crop Temperatures to Estimate Evapotranspiration,
W76-08591 2D

CROSS-FLORIDA CANAL
Reassessment of the Cross-Florida Barge Canal: A Probability Approach,
W76-08228 4A

CRUSTACEANS
Cladocera and Gastropoda Population Ecology in the Danube Flood Plain, (In Romanian),
W76-08308 2H

A Simple Continuous-Flow Respirometer for Comparative Respiratory Changes in Medium-Sized Aquatic Organisms,
W76-08353 5C

Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

CULTIVATION
Ecology and Prospects of Using the Amphipod Gammarus (R.) Balcanicus Schaef, (In Russian),
W76-08410 2I

Deep Tillage of Graded-Furrow-Irrigated Pullman Clay Loam,
W76-08543 3F

CUMBERLAND BASIN (AUSTRALIA)
Effects of Hydrologic Regime on Magnitude and Frequency of Dominant Discharge,
W76-08514 2E

CURRENT VECTORS
Measurements of Current Flow During Summer in Lake Huron,
W76-08413 2H

CURRENTS (WATER)
Some Three-Dimensional Characteristics of Low-Frequency Current Fluctuations Near the Oregon Coast,
W76-08336 2L

Measurements of Current Flow During Summer in Lake Huron,
W76-08413 2H

CUTTING MANAGEMENT
First-Year Water Yield Increase After Forest Cutting: An Alternative Model,
W76-08362 4C

CYANIDE
Cyanide Treatment in the Metal Finishing Industry,
W76-08271 5D

A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

CYANIDE WASTES
Updating an Existing Pollution Control Facility at Western Electric,
W76-08477 5D

The Electrolytic Processing of Cyanide Wastes,
W76-08706 5D

CYANIDES
Process for the Environmentally Favorable Destruction of Solid and/or Liquid Cyanide Waste,
W76-08208 5D

CYANOPHYTA
Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

Role of Far Eastern Herbivorous Fish in Ecosystems of Natural Water Bodies Used for Acclimatization, (In Russian),
W76-08666 5C

CYCLING NUTRIENTS
Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

DAM FAILURE
Evaluation of Mill Tailings Disposal Practices and Potential Dam Stability Problems in Southwestern United States, General Report, Volume I,
W76-08143 5G

DAM FOUNDATIONS
International Association of Engineering Geology, Proceedings of the Second International Congress, Volume 2.
W76-08418 8E

DAMPING
Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case,
W76-08124 2F

DAMS
Dimensionless Solution of Dam-Break Flood Waves,
W76-08343 8B

DATA BASES
Updating the Navy Environmental Protection Data Base to Incorporate Oil Spill Clean-Up Performance,
W76-08320 5B

DATA COLLECTIONS
Evaluation of ERTS Data for Certain Hydrological Uses,
W76-08147 7C

Water Resources of the World, Selected Statistics.
W76-08507 7C

Impact of Remote Sensing Upon the Planning, Management, and Development, and Development of Water Resources,
W76-08536 6B

Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

DATA PROCESSING
Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

DDD
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

DDE
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

DDT
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

Baseline Concentrations of Polychlorinated Biphenyls and DDT in Lake Michigan Fish, 1971,
W76-08685 5A

DECOLORIZATION
Decolorizing Method for Waste Kraft Paper Mill Effluents,
W76-08207 5D

DEGREE-DAY FACTOR
Snowmelt-Runoff Model for Stream Flow Forecasts,
W76-08131 2E

DELAY INDEX
Transient Free Surface Flow to a Well: An Analysis of Theoretical Solutions,
W76-08333 2F

DELAYED YIELD
Transient Free Surface Flow to a Well: An Analysis of Theoretical Solutions,
W76-08333 2F

DEMAND
Present and Future Multiple use Demands on the Pinyon-Juniper Type,
W76-08430 4A

DEMINERALIZATION
Solid Mineral and Regenerant Recovery for Ion-Exchange Resins,
W76-08199 3A

DENITRIFICATION
A New Sewage Treatment Technique for the Purpose of Nitrogen Elimination (I): Biological Denitrogenization of Urban Sewage (Chisso jokyo o mokuteki to shite atarashii gesui shori gijutsu (I),--Toshi gesui kara no seibutsugakuteki datsu chissoho ni tsuite),
W76-08274 5D

Nitrate Reduction and Associated Microbial Populations in a Ponded Hanford Sandy Loam,
W76-08546 5G

The Nitrogen Balance of Arctic Tundra: Pathways, Rates, and Environmental Implications,
W76-08678 5B

DENSITY
Surface Circulation Pattern in the Gulf of St. Lawrence,
W76-08126 2L

DENSITY PLUME
Dense Effluent Dispersion in a Stream,
W76-08316 5B

DEPOSITION (SEDIMENTS)
Flood Plain Information: San Antonio Creek and Tributaries, Vicinity of OJAI, Ventura County, California.
W76-08380 4A

A Physical Model for the Rate of Deposition of Fine-Grained Sediments in the Deep Sea,
W76-08736 2J

DESALINATION
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 1-5 MGD Plants, Plants for High Product Recovery,
W76-08118 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 3-25 MGD Low Pressure Plants,
W76-08119 3A

Development of Assymmetric Cellulose Triacetate Membranes for Seawater Desalination,
W76-08283 3A

Field Evaluation Testing of Reverse Osmosis High Pressure Pumps and Energy Recovery Turbines.
W76-08372 3A

Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

DESALINATION PLANTS
Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 1-5 MGD Plants, Plants for High Product Recovery,
W76-08118 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 3-25 MGD Low Pressure Plants,
W76-08119 3A

Engineering and Economic Study of Reverse Osmosis Sea Water Desalting Plants, Design of 1-10 MGD Seawater Plants,
W76-08284 3A

Commercial Membrane Desalting Plants: Data and Analysis,
W76-08370 3A

DESALINATION PROCESSES
Commercial Membrane Desalting Plants: Data and Analysis,
W76-08370 3A

Desalting Handbook for Planners.
W76-08584 3A

DESIGN
Morrell Pioneers More Efficient Aeration,
W76-08286 5D

A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part II: Design Concept,
W76-08661 8I

DESIGN CRITERIA
Development of Storm Drainage Cost Functions,
W76-08227 3D

Desalting Handbook for Planners.
W76-08584 3A

Development of Biological Design Criteria for Fish Screens and Barriers,
W76-08662 8I

DESIGN FLOOD
Examination of the Concept and Use of the Standard Project Flood,
W76-08321 8B

DESIGN STANDARDS
Examination of the Concept and Use of the Standard Project Flood,
W76-08321 8B

DESIGN STORM
Examination of the Concept and Use of the Standard Project Flood,
W76-08321 8B

DESORPTION
Phosphorus Movement in Soils: Soil-Orthophosphate Reaction Kinetics,
W76-08672 5B

DETOXIFICATION
Detoxification of Bleached Kraft Mill Effluents,
W76-08461 5D

DETRITUS
The Role of Organic Detritus in the Formation of Distinctive Sandy Tidal Flat Sedimentary Structures, Tay Estuary, Scotland,
W76-08524 2L

Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

DEWATERING
Apparatus for Continuous Dewatering of Aqueous Suspensions,
W76-08202 5D

Dewatering Vegetable Waste.
W76-08487 5E

DIATOMS
Planktonic Ecosystems: The Effects of Dystrophic Conditions on Structure and Function in the Gulf of Fos, (In French),
W76-08312 5C

DICKINSON BAYOU (TEX)
Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

DIELDRIN
Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

DIFFUSION
Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

DIFFUSIVITY
Calculating the Unsaturated Hydraulic Conductivity and Diffusivity,
W76-08142 2G

Infiltration Analysis and Perturbation Methods 1. Absorption with Exponential Diffusivity,
W76-08334 2G

DIGESTION
Changing Hog Hair from Costly Nuisance to Asset.
W76-08297 5D

DIGITAL COMPUTERS
Abstract Models of Communities of Aquatic Animals,
W76-08218 8I

DINOFLAGELLATES
Planktonic Ecosystems: The Effects of Dystrophic Conditions on Structure and Function in the Gulf of Fos, (In French),
W76-08312 5C

DISCHARGE (WATER)
Effects of Hydrologic Regime on Magnitude and Frequency of Dominant Discharge,
W76-08514 2E

Exit of Ground Waters on Drainage Boundaries,
W76-08750 2F

DISINFECTION
Demand Bactericide for Disinfecting Water and Process of Preparation,
W76-08391 5D

DISPERSION
Dense Effluent Dispersion in a Stream,
W76-08316 5B

Simulation of Hydraulic Processes in Open Channels,
W76-08344 8B

Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

Transfer of Boron and Tritiated Water Through Sandstone,
W76-08547 5B

DISPERSION CLAYS
Fundamental Aspects of Erosion of Cohesive Soils,
W76-08540 2J

DISPOSAL
Evaluation of Mill Tailings Disposal Practices and Potential Dam Stability Problems in Southwestern United States, General Report, Volume I,
W76-08143 5G

DISPOSAL PRACTICES
Evaluation of Mill Tailings Disposal Practices and Potential Dam Stability Problems in Southwestern United States, General Report, Volume I,
W76-08143 5G

DISPOSAL SYSTEMS AND METHODS
Evaluation of Mill Tailings Disposal Practices and Potential Dam Stability Problems in Southwestern United States, General Report, Volume I,
W76-08143 5G

DISSOLVED OXYGEN
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

The Influence of Water Quality on Accumulation of Heavy Metals in Aquatic Organisms,
W76-08456 5C

Effects of Condenser Destruction of Algae on Dissolved Oxygen Levels in the James River,
W76-08638 5C

Distributions of BOD and Do In Rivers and Lakes,
W76-08743 5B

DISTRIBUTION PATTERNS
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

Distribution of Chaetognatha and Biomass of the Zooplankton in the Western Part of the Tropical Atlantic, During July and August 1968, (In Spanish),
W76-08245 2L

Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Distributions of Transuranium Nuclides in Sediment and Biota of the North Atlantic Ocean,
W76-08602 5B

Comparison of the Distributions in Marine Sediments of the Fallout Derived Nuclides Fe 55 and Pu 239,240, A New Approach to the Chemistry of Environmental Radionuclides,
W76-08603 5B

Distributions of BOD and Do In Rivers and Lakes,
W76-08743 5B

DIURNAL DISTRIBUTION
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

DIVERSION STRUCTURES
Fish Passage Through Turbines, Conduits, and Spillway Gates,
W76-08651 8I

A Functional Evaluation of a Large Louver Screen Installation and Fish Facilities Research on California Water Diversion Projects,
W76-08652 8I

Adaptation of Hydro Fish Facilities to Steam-Electric Stations,
W76-08654 8I

Status of Air Bubble Fish Protection System at Indian Point Station on the Hudson River,
W76-08657 8I

Preliminary Studies on the Effects of Air Bubbles and Intense Illumination on the Swimming Behavior of the Striped Bass (Morone Saxitalis) and the Gizzard Shad (Dorosoma Cepedianum),
W76-08658 8I

Experimental Studies in Guiding Marine Fishes of Southern California with Screens and Louvers,
W76-08659 8I

DOMESTIC WATER
Residential Water Conservation,
W76-08103 3D

DOMINANT DISCHARGE
Effects of Hydrologic Regime on Magnitude and Frequency of Dominant Discharge,
W76-08514 2E

DRAIN ENVELOPES
Drain Envelope Response to Field Treatments,
W76-08548 4A

DRAINAGE
Infiltration into Increasingly Permeable Soils,
W76-08516 2G

Investigation of Roadway Drainage as Related to the Performance of Flexible Pavements,
W76-08534 8B

Drain Envelope Response to Field Treatments,
W76-08548 4A

Planning Irrigation and Drainage Systems Using Retention and Extraction Limits,
W76-08553 3F

Outflow from Various Subsurface Drainage Materials,
W76-08669 4A

Nitrate, Phosphate, and Potassium Movement into Drainage Lines under Three Soil Management Systems,
W76-08680 5B

DRAINAGE AREA
Environmental Monitoring from Spacecraft Data,
W76-08532 5A

DRAINAGE DENSITY
The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

DRAINAGE ENGINEERING
Drain Envelope Response to Field Treatments,
W76-08548 4A

DRAINAGE PATTERNS (GEOLOGIC)
The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

DRAINAGE PRACTICES
Land Use and Water Quality in New York Rivers,
W76-08133 5B

DRAINAGE SYSTEM
Pumps Free City from Lake Erie Flooding.
W76-08250 8C

DRAINAGE SYSTEMS
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

Half-Section Pipe Used Effectively,
W76-08237 8F

Drain Envelope Response to Field Treatments,
W76-08548 4A

Outflow from Various Subsurface Drainage Materials,
W76-08669 4A

DRAINAGE WATER
Calculated Drainage Water Compositions and Salt Burdens Resulting from Irrigation with River Waters in the Western United States,
W76-08671 5B

Nitrate, Phosphate, and Potassium Movement into Drainage Lines under Three Soil Management Systems,
W76-08680 5B

DRAINS
Drain Envelope Response to Field Treatments,
W76-08548 4A

Outflow from Various Subsurface Drainage Materials,
W76-08669 4A

DRAWDOWN
Estimation by Digital Computer of the Drawdown Caused by Groundwater Withdrawal,
W76-08140 4B

Improved Image-Well Technique for Aquifer Analysis,
W76-08517 4B

DREDGE SPOIL
Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

DREDGING
Guidelines for Material Placement in Marsh Creation,
W76-08325 5G

Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

DRIFTING (AQUATIC)
A Seabed Drifter Study of Near-Bottom Circulation in North Carolina Shelf Waters,
W76-08350 2L

DRILLERS LOGS
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

DRIP IRRIGATION
Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

DROUGHT DURATION
Some Theoretical Considerations in Reservoir Design,
W76-08518 8B

DROUGHTS
Some Theoretical Considerations in Reservoir Design,
W76-08518 8B

DRY CAUSTIC PEELING
Dry Caustic Peeling of Beets and Carrots Reduces Pollution,
W76-08504 5D

DRY WEATHER FLOWS
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

DUCK-PROCESSING INDUSTRY
Duck-Processing Waste,
W76-08168 3E

DUPLIN ESTUARY (GA)
Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

DUST
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

DYES
Treatment of Dye Wastes with Granular Activated Carbon,
W76-08716 5D

Canton's Futuristic Waste Treatment System,
W76-08720 5D

DYSTROPHY
Planktonic Ecosystems: The Effects of Dystrophic Conditions on Structure and Function in the Gulf of Fos, (In French),
W76-08312 5C

EARTH PRESSURE
Earth Pressure Observations on a Retaining Wall in Expansive Clay, Gougher Street Mail Exchange, Adelaide,
W76-08424 8D

EARTHQUAKE ENGINEERING
Nonlinear Earthquake Response of Concrete Gravity Dams,
W76-08426 8F

EARTHQUAKES
The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

ECOLOGY
The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

An Ecologic Survey of Lake Endine, (In Italian),
W76-08244 5C

Ecology of the Zooplankton in the Gulf of Cariaco. Part I: Variability of the Biomass of the Zooplankton During the Period from August to November, 1973, (In Spanish),
W76-08247 5C

Cladocera and Gastropoda Population Ecology in the Danube Flood Plain, (In Romanian),
W76-08308 2H

ECONOMIC EFFICIENCY
Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality,
W76-08152 6B

Water Supply.
W76-08153 4A

Water Allocation.
W76-08154 6B

ECONOMIC FEASIBILITY
Alternatives for Reducing Water Pollution in Cattlehide Processing and Tanning,
W76-08285 3E

Economics of In-Plant Waste Management in Food Processing,
W76-08300 3E

ECONOMICS
Soil Loss from Illinois Farms - Economic Analysis of Productivity Loss and Sedimentation Damage,
W76-08533 4D

ECOSYSTEMS
Planktonic Ecosystems: The Effects of Dystrophic Conditions on Structure and Function in the Gulf of Fos, (In French),
W76-08312 5C

A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

Natural and Agricultural Ecosystems,
W76-08667 6G

EDDY DIFFUSIVITY
Steady Stratified Circulation in a Cavity,
W76-08136 2H

EDDY VISCOSITY
Steady Stratified Circulation in a Cavity,
W76-08136 2H

EDIBLE OIL REFINERY
Design and Performance of Physical-Chemical and Activated Sludge Treatment for an Edible Oil Plant,
W76-08293 5D

EEL RIVER (CALIF)
Flood Plain Information: Eel River--Stafford to Holmes, Humboldt County, California,
W76-08378 4A

EFFECTIVE PRECIPITATION
Eastern Lake Ontario Precipitation Network,
W76-08412 2B

EFFLUENTS
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

Oxygen Relationships in a Soil Treated with Sewage Effluent,
W76-08231 5D

Efficient Chemical Method for the Treatment of Zinc Manufacturing Plant Generated Waste Waters (Effektivnyy khimicheskikh sposob ochistki stochnykh vod tsinkovogo zavoda),
W76-08268 5D

Dense Effluent Dispersion in a Stream,
W76-08316 5B

EGG GRADING
Egg-Processing Plant Wastes,
W76-08170 3E

EGG PRODUCTS PLANT
Coagulation with Chitosan - An Aid to Recovery of By-Products from Egg Breaking Wastes,
W76-08289 5D

EGG PRODUCTS PLANTS
Wastewater Control at Egg Products Plants, Pt. 1-3.
W76-08291 3E

EKMAN VEERING
Ekman Veering Observed Near the Ocean Bottom,
W76-08129 2L

ELECTRIC POWER
Ocean Thermal Energy Conversion.
W76-08366 8C

ELECTRIC POWER DEMAND
Irrigation System Management for Reducing Peak Electrical Demands,
W76-08549 3F

ELECTRICAL CONDUCTANCE
Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

ELECTRODIALYSIS
Commercial Membrane Desalting Plants: Data and Analysis,
W76-08370 3A

ELECTROENCEPHALOGRAPHY
Electrophysiological Studies of Morpholine-Imprinted Coho Salmon (Oncorhynchus Kisutch) and Rainbow Trout (Salmo Gairdneri),
W76-08438 5C

ELECTROLYSIS
Method for Treating Sewage Water,
W76-08394 5D

Process for the Electrolytic Reclamation of Spent Etching Fluids,
W76-08471 5D

The Electrolytic Processing of Cyanide Wastes,
W76-08706 5D

Electrolytic Purification of Trade Effluents Containing Toxic Materials,
W76-08709 5D

ELECTROLYTES
Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

ELECTROLYTIC RECLAMATION
Process for the Electrolytic Reclamation of Spent Etching Fluids,
W76-08471 5D

ELECTRON MICROSCOPY
Soil Stabilization with Powdered and Coarse Quicklime,
W76-08422 8D

ELECTROPLATING WASTES
A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

ELIMINATION OF DISCHARGE (WASTES)
Innovative Technologies for Water Pollution (Abatement).
W76-08220 5G

EMBRYONIC GROWTH STAGE
Effects of Temperature and Salinity on the Survival of Winter Flounder Embryos,
W76-08437 5C

Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

EMULSIONS
Treating Waste Liquors Containing Metal-Working Oil Emulsions.
W76-08492 5D

ENERGY
What Does a 'Clean' Environment Cost,
W76-08150 5G

Energy Content of the Benthos and Epifauna in the Pongola River, Natal, (In Afrikaans),
W76-08158 2I

Refuse into Power,
W76-08693 5D

ENERGY CONVERSION
Ocean Thermal Energy Conversion.
W76-08366 8C

ENERGY DISSIPATION
Dissipation of Turbulent Energy in a Natural Channel,
W76-08744 8B

ENGINEER ESTIMATES
Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

ENGINEERING GEOLOGY
International Association of Engineering Geology, Proceedings of the Second International Congress, Volume I.
W76-08417 8D

International Association of Engineering Geology, Proceedings of the Second International Congress, Volume 2.
W76-08418 8E

ENGINEERS ESTIMATES
Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 1-5 MGD Plants, Plants for High Product Recovery,
W76-08118 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 3-25 MGD Low Pressure Plants,
W76-08119 3A

Engineering and Economic Study of Reverse Osmosis Sea Water Desalting Plants, Design of 1-10 MGD Seawater Plants,
W76-08284 3A

ENGLAND
Water Temperature Variations Within a Major River System,
W76-08340 2E

ENTRAINMENT
Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop.
W76-08628 8I

Evaluation of Entrainment Effect,
W76-08629 8I

Summary of Entrainment Research at the Millstone Point Nuclear Power Station, 1970 to 1972,
W76-08632 5C

Entrainment Studies on Hudson River Organisms,
W76-08633 5C

Entrainment of Planktonic Organisms into Cooling Water Systems of Three Mid-Atlantic Thermal Power Plants,
W76-08635 5C

Phytoplankton Entrainment Studies at the Indian River Estuary, Delaware,
W76-08636 5C

Effects of Condenser Entrainment on Algal Photosynthesis at Mid-Atlantic Power Plants,
W76-08637 5C

Effects of Condenser Destruction of Algae on Dissolved Oxygen Levels in the James River,
W76-08638 5C

Entrainment of Zooplankton at Three Mid-Atlantic Power Plants,
W76-08639 5C

Zooplankton Studies at Morgantown,
W76-08640 5C

The Effects of Entrainment on Phytoplankton at the Morgantown Steam Electric Station, Potomac River Estuary, September 5-8, 1972,
W76-08641 5C

Biochemical Studies of Entrained Phytoplankton at the Morgantown Maryland Power Plant,
W76-08642 5C

Morgantown Entrainment. Part IV. Phytoplankton Taxonomic Studies,
W76-08643 5C

Response of Phytoplankton to Thermal Stress,
W76-08644 5C

Entrainment Studies at Turkey Point on Biscayne Bay: Have Thermal Effects Affected the Plankton of Biscayne Bay,
W76-08645 5C

Laboratory Simulation of Power Plant Effects: Response of Some Estuarine Phytoplankters to Time Temperature Combinations,
W76-08646 5C

Traveling Screens for Turbine Intakes of Hydroelectric Dams,
W76-08647 8I

Fish Diversion Systems and Biological Investigation of Horizontal Traveling Screen Model VII,
W76-08648 8I

Mechanical Operation of Horizontal Traveling Screen Model VII,
W76-08649 8I

Vertical Traveling Fish Basket Collector,
W76-08650 8I

Fish Passage Through Turbines, Conduits, and Spillway Gates,
W76-08651 8I

A Functional Evaluation of a Large Louver Screen Installation and Fish Facilities Research on California Water Diversion Projects,
W76-08652 8I

Numbers of Individuals and Injury Rates of Fishes Caught on Revolving Screens at the P. H. Robinson Generating Station,
W76-08653 8I

Adaptation of Hydro Fish Facilities to Steam-Electric Stations,
W76-08654 8I

Conventional Fish Screening Systems and Some Promising Alternatives,
W76-08655 8I

Vulnerability and Survival of Young Connecticut River Fish Entrained at a Nuclear Power Plant,
W76-08656 8I

Preliminary Studies on the Effects of Air Bubbles and Intense Illumination on the Swimming Behavior of the Striped Bass (Morone Saxitalis) and the Gizzard Shad (Dorosoma Cepedianum),
W76-08658 8I

A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part I: Model Studies and Fouling Control Techniques,
W76-08660 8I

A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part II: Design Concept,
W76-08661 8I

Development of Biological Design Criteria for Fish Screens and Barriers,
W76-08662 8I

ENVIRONMENT

Identification, Measurement, and Incorporation of Environmental Quality Objectives in Natural Resource Development,
W76-08101 6B

ENVIRONMENTAL EFFECTS

Efficient Resource Utilization Within a Regional Framework.
W76-08102 6B

The State of Water in Plant Tissues at Negative Temperatures under Natural Conditions, (In Russian),
W76-08368 2I

Savannah River Laboratory Environmental Transport and Effects Research Annual Report - 1974.
W76-08596 5B

Transuranium Nuclides in the Environment.
W76-08597 5C

Plutonium in the Aquatic Environment, Its Behaviour, Distribution and Significance,
W76-08599 5C

Plutonium in Atlantic Coastal Estuaries in the Southeastern United States of America,
W76-08600 5C

Environmental and Public Health Consequences of the Controlled Disposal of Transuranic Elements to the Marine Environment,
W76-08604 5C

Interaction of Plutonium with Complexing Substances in Soils and Natural Waters,
W76-08605 5B

Plutonium Radionuclides in the Groundwaters at Enewetak Atoll,
W76-08607 5B

Evaluation of Entrainment Effect,
W76-08629 8I

Entrainment and Thermal Effects on a Mysid Shrimp and Striped Bass in the Sacramento-San Joaquin Delta,
W76-08631 5C

ENVIRONMENTAL ENGINEERING

Land-Use Model For Service Area Projection,
W76-08226 5G

ENVIRONMENTAL ENGINEERS

A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

ENVIRONMENTAL IMPACTS

The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

ENVIRONMENTAL QUALITY

Identification, Measurement, and Incorporation of Environmental Quality Objectives in Natural Resource Development,
W76-08101 6B

ENZYMES

Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

EPIBIOTIC FOULING

Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

EPIFAUNA

Energy Content of the Benthos and Epifauna in the Pongola River, Natal, (In Afrikaans),
W76-08158 2I

EPIPHYTES

Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

EQUATIONS

Use and Misuse of the Universal Soil Loss Equation,
W76-08120 2J

Transient Free Surface Flow to a Well: An Analysis of Theoretical Solutions,
W76-08333 2F

Study of the Effectiveness of Removing Heavy Metals in Biological Purification of Municipal Sewage, (In Russian),
W76-08580 5D

Relation Between Plant Transpiration and Metabolism, (In Russian),
W76-08583 2D

EQUIPMENT

Safeguard Fluid-Handling Equipment with Pipeline Basket Strainers,
W76-08235 8G

EROSION

Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

Fundamental Aspects of Erosion of Cohesive Soils,
W76-08540 2J

EROSION CONTROL

Efficient Resource Utilization Within a Regional Framework.
W76-08102 6B

Use and Misuse of the Universal Soil Loss Equation,
W76-08120 2J

ERROR

The Estimation of Local Rainfall by Sample Gauging,
W76-08348 2B

ERROR ANALYSIS

Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

ERTS

ERTS-1 Investigation of Wetlands Ecology,
W76-08319 2L

Evaluation of Glacier Mass Balance by Observing Variations in Transient Snowline Positions,
W76-08322 2C

Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

Environmental Monitoring from Spacecraft Data,
W76-08532 5A

Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

ERTS DATA

Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

ESTIMATED COSTS

Water Quality.
W76-08155 5G

Water Pollution Abatement Technology, Capabilities and Costs, Textile Industry.
W76-08186 5G

Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

Desalting Handbook for Planners.
W76-08584 3A

ESTIMATING

Development of Storm Drainage Cost Functions,
W76-08227 3D

ESTIMATING EQUATIONS

Interstation Correlation of Peak-Flow Estimates,
W76-08555 4A

ESTUARIES

Shooting Models for Salinity and Coliform,
W76-08134 5B

ERTS-1 Investigation of Wetlands Ecology,
W76-08319 2L

Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

Numerical Computation of Two-Dimensional Flows,
W76-08341 2L

A Seabed Drifter Study of Near-Bottom Circulation in North Carolina Shelf Waters,
W76-08350 2L

Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

The Role of Organic Detritus in the Formation of Distinctive Sandy Tidal Flat Sedimentary Structures, Tay Estuary, Scotland,
W76-08524 2L

Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

Computation of Tidal Flow in Well-Mixed Estuaries,
W76-08741 2L

ESTUARINE ENVIRONMENT

A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

EUCALYPTUS REGNANS

Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

EUROPE

Recycling--Examples for Its Possibilities and Limits (Recycling--Beispiele fuer Moeglichkeiten und Grenzen),
W76-08701 5D

EUTROPHICATION

Biological Problems of a Manmade Small Lake, (In German),
W76-08107 5C

An Assessment of Eutrophication in Australian Inland Waters,
W76-08162 5C

The Effect of Controlled Eutrophication on Solar Radiation Penetrating into Ponds, (In Polish),
W76-08305 5C

Eutrophication of Microponds,
W76-08354 5C

Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

EVALUATION

Identification, Measurement, and Incorporation of Environmental Quality Objectives in Natural Resource Development,
W76-08101 6B

Economic Evaluation of Proposed Water Conservation Practices on Established Irrigation Districts: A General Methodology and Application to Three Districts in Oregon,
W76-08431 3F

EVAPORATION

On-Site Runoff Depletion at Three Impoundments,
W76-08122 4A

EVAPOTRANSPIRATION

A Model for Estimating Actual Evapotranspiration from Potential Evapotranspiration,
W76-08132 2D

Water Use by Saltcedar as Measured by the Water Budget Method,
W76-08573 2D

Great Plains Evapotranspiration by a Resistance Model Using Remotely Sensed Thermal Imagery,
W76-08585 2D

Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

An Evaluation of a Resistance Form of the Energy Balance to Estimate Evapotranspiration,
W76-08587 2D

Resistance-Mass Transfer Method for Estimating Evapotranspiration: Comparison with Lysimetric Measurements in Irrigated Sorghum,
W76-08588 2D

Comparison of a Modified Brown-Rosenberg Resistance Model with other Evapotranspiration Estimation Methods: Tests in an Irrigated Sorghum Field,
W76-08589 2D

Canopy Temperature Measurement of Sorghum and Millet with Leaf Thermocouple and Infrared Thermometer Techniques,
W76-08590 2D

Thermal Scanner Measurements of Crop Temperatures to Estimate Evapotranspiration,
W76-08591 2D

EXCESSIVE PRECIPITATION

Extreme Rainfall Studies of the Brahmani, The Burhabalang, The Rushikulya and the Subarnarekha River Catchments,
W76-08733 2B

EXPANSIVE CLAYS

Properties of Expansive Clay Soils; Report 2, A Numerical Procedure for Predicting Heave with Time,
W76-08420 8D

EXTENDED AERATION TANKS

Waste Treatment and Control at Live Oak Poultry Processing Plant,
W76-08185 3E

EYEFLUKE

Studies on the Host Specificity of the Eyefluke Diplostomum Spathaceum, in Brown and Rainbow Trout,
W76-08302 5C

FARM MANAGEMENT
Use and Misuse of the Universal Soil Loss Equation,
W76-08120 2J

Soil Loss from Illinois Farms - Economic Analysis of Productivity Loss and Sedimentation Damage,
W76-08533 4D

FARM PONDS
Eutrophication of Microponds,
W76-08354 5C

FARM WASTES
Nitrogen and Phosphorus Losses from Winter Disposal of Dairy Manure,
W76-08159 5C

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972
Water Pollution Abatement Technology, Capabilities and Costs, Textile Industry.
W76-08186 5G

Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

Capabilities and Costs of Technology for the Organic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08188 5G

Capabilities and Costs of Technology for the Inorganic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08189 5G

Water Pollution Abatement Technology: Costs and Capabilities Petroleum Refining Industry, Part 1, Chapters -V.
W76-08190 5G

Water Pollution Abatement Technology: Costs and Capabilities, Petroleum Refining Industry, Part 2, Chapters VI - IX.
W76-08191 5G

Water Pollution Control Act of 1972, Institutional Assessment, Planning.
W76-08192 5G

The Water Pollution Control Act of 1972, Institutional Assessment, The Permit Program.
W76-08193 5G

Water Pollution Control Act of 1972, Institutional Assessment, Construction Grants.
W76-08194 5G

An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

Innovative Technologies for Water Pollution (Abatement).
W76-08220 5G

The Water Pollution Control Act of 1972 Institutional Assessment, Attitudes of Participants.
W76-08221 5G

Water Pollution Abatement Technology: Capabilities and Costs, Urban Runoff.
W76-08222 5G

FERMENTATION
Methane Fermentation of Rubber (Hevea Brasiliensis) Latex Effluent,
W76-08722 5D

FERTILIZATION
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

Effects of Forest Fertilization on Two Southeast Alaska Streams,
W76-08673 5B

FIERING TWO-STATION MODEL
A Reconsideration of the Fiering Two-Station Model,
W76-08519 4A

FILTERS
Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

Modular Water Filter,
W76-08210 5F

Water Filter Assembly,
W76-08392 8C

Dewatering Vegetable Waste.
W76-08487 5E

A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part I: Model Studies and Fouling Control Techniques,
W76-08660 8I

A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part II: Design Concept,
W76-08661 8I

FILTRATION
Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

Modular Water Filter,
W76-08210 5F

Water Filter Assembly,
W76-08392 8C

Catalytic Filtering-Incinerating Process and Device for Waste Water,
W76-08400 5D

Hygienic Substantiation of the Possibility of Wastewater Treatment of Poultry Processing Plants on Underground Filter Beds, (In Russian),
W76-08581 5D

Paper Making Waste-Water Purification.
W76-08695 5D

High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

FINITE DIFFERENCE ANALYSIS
Properties of Expansive Clay Soils; Report 2, A Numerical Procedure for Predicting Heave with Time,
W76-08420 8D

FINITE DIFFERENCE GRADIENTS
An Integrated Finite Difference Method for Analyzing Fluid Flow in Porous Media,
W76-08123 2F

FINITE ELEMENT ANALYSIS
An Integrated Finite Difference Method for Analyzing Fluid Flow in Porous Media,
W76-08123 2F

Steady Stratified Circulation in a Cavity,
W76-08136 2H

Application of the Finite Element Method in Foundation Engineering (Die Anwendung der Methode der Finiten Elemente in der Grundbaupraxis),
W76-08423 8D

Dynamic Response of Aquifer Systems to Localized Recharge,
W76-08520 2F

FISH
Age Composition and Growth of Aspius Aspius (L.) in the Lower Volga, (In Russian),
W76-08255 2I

A Simple Continuous-Flow Respirometer for Comparative Respiratory Changes in Medium-Sized Aquatic Organisms,
W76-08353 5C

Baseline Concentrations of Polychlorinated Biphenyls and DDT in Lake Michigan Fish, 1971,
W76-08685 5A

FISH BARRIERS
Perforated-Pipe Water Intake for Fish Protection,
W76-08137 8I

Conventional Fish Screening Systems and Some Promising Alternatives,
W76-08655 8I

FISH BREEDING
Biological Background of the New Element of Sturgeon Artificial Rearing Methods, (In Russian),
W76-08663 8I

FISH DIETS
An Experiment on the Feeding of Fry of Catfish Heteropneustes Fossilis,
W76-08575 2I

FISH DISEASES
Studies on the Host Specificity of the Eyefluke Diplostomum Spathaceum, in Brown and Rainbow Trout,
W76-08302 5C

Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

FISH EGGS
Effects of Temperature and Salinity on the Survival of Winter Flounder Embryos,
W76-08437 5C

FISH FOOD
Ecology and Prospects of Using the Amphipod Gammarus (R.) Balcanicus Schaef, (In Russian),
W76-08410 2I

FISH FOOD ORGANISMS
The Selection of Prey in 3 Malacophagous Fishes of Lake Chad, (In French),
W76-08178 2H

FISH FOOD ORGANISMS

Ecology and Prospects of Using the Amphipod Gammarus (R.) Balcanicus Schaef, (In Russian),
W76-08410 2I

Culture and Growth of Northern Anchovy, Engraulis Mordax Larvae,
W76-08432 2L

FISH GUIDING
Experimental Studies in Guiding Marine Fishes of Southern California with Screens and Louvers,
W76-08659 8I

FISH HANDLING FACILITIES
A Functional Evaluation of a Large Louver Screen Installation and Fish Facilities Research on California Water Diversion Projects,
W76-08652 8I

FISH HATCHERIES
Survival Rate of Starving Carp (Cyprinus Carpio Linne), (In Russian),
W76-08552 5C

Biological Background of the New Element of Sturgeon Artificial Rearing Methods, (In Russian),
W76-08663 8I

Abundance and Biomass of Bacterioplankton of 'Tastaka' Ponds, (In Russian),
W76-08664 5C

FISH MIGRATION
Electrophysiological Studies of Morpholine-Imprinted Coho Salmon (Oncorhynchus Kisutch) and Rainbow Trout (Salmo Gairdneri),
W76-08438 5C

Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

FISH PHYSIOLOGY
Culture and Growth of Northern Anchovy, Engraulis Mordax Larvae,
W76-08432 2L

FISH POPULATIONS
Studies on the Animal Communities in Two North Florida Salt Marshes. Part I. Fish Communities,
W76-08161 2L

Development Trends in Methods used to Model Populations and Communities,
W76-08212 8I

Development Trends in Methods Used to Model Populations and Communities,
W76-08213 8I

Abstract Models of Fish Populations,
W76-08215 8I

Models of Actual Fish Populations,
W76-08216 8I

Models of Actual Communities,
W76-08219 8I

FISH REPRODUCTION
Effects of Temperature and Salinity on the Survival cf Winter Flounder Embryos,
W76-08437 5C

Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

FISHERIES
Rearing the Sevan Trout at the Aigerlich Trout Pond Fishery, (In Armenian),
W76-08371 2I

FISHKILL
Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

FJORDS
Oceanographic Conditions During 1973 in Russel Fjord, Alaska,
W76-08525 2L

FLASH-FLOOD WARNINGS
Application of the National Weather Service Flash-Flood Program in the Western Region,
W76-08415 4A

FLASH-FLOOD WATCHES
Application of the National Weather Service Flash-Flood Program in the Western Region,
W76-08415 4A

FLASH FLOODS
Application of the National Weather Service Flash-Flood Program in the Western Region,
W76-08415 4A

FLEXIBLE PAVEMENTS
Investigation of Roadway Drainage as Related to the Performance of Flexible Pavements,
W76-08534 8B

FLOCCULATION
Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

Zero Energy Input Flocculator,
W76-08200 5F

Paper Making Waste-Water Purification.
W76-08695 5D

FLOCCULATORS
Zero Energy Input Flocculator,
W76-08200 5F

FLOOD CONTROL
Efficient Resource Utilization Within a Regional Framework.
W76-08102 6B

Development of Storm Drainage Cost Functions,
W76-08227 3D

Examination of the Concept and Use of the Standard Project Flood,
W76-08321 8B

FLOOD DAMAGE
Fast Replacement of a Flood-Damaged Interceptor,
W76-08240 8F

Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

Flood Plain Information: Eel River--Stafford to Holmes, Humboldt County, California,
W76-08378 4A

FLOOD DATA
Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

Flood Plain Information: Eel River--Stafford to Holmes, Humboldt County, California,
W76-08378 4A

Flood Plain Information: Saline River and Tributaries, Benton, Arkansas.
W76-08389 4A

Flood Plain Information: Colorado River and Rifle, Government, Hubbard Gulch Creeks, Rifle, Colorado.
W76-08390 4A

FLOOD DETENTION
Preliminary Hydrologic Design of Small Flood Detention Reservoirs,
W76-08731 8B

FLOOD FLOW
Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

FLOOD FORECASTING
Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

Flood Plain Information: Eel River--Stafford to Holmes, Humboldt County, California,
W76-08378 4A

Flood Plain Information: San Felipe Lake, Pacheco Creek, San Benito County, California.
W76-08379 4A

Flood Plain Information: Saline River and Tributaries, Benton, Arkansas.
W76-08389 4A

Application of the National Weather Service Flash-Flood Program in the Western Region,
W76-08415 4A

FLOOD PLAINES
Flood Plain Information: Alamo and Ulatis Creeks, Vacaville, California.
W76-08377 4A

FLOOD PLAINS
Flood Plain Information: Eel River--Stafford to Holmes, Humboldt County, California,
W76-08378 4A

Flood Plain Information: San Felipe Lake, Pacheco Creek, San Benito County, California.
W76-08379 4A

Flood Plain Information: San Antonio Creek and Tributaries, Vicinity of OJAI, Ventura County, California.
W76-08380 4A

Flood Plain Information: Purgatoire River and Tributaries, Vicinity of Trinidad, Colorado.
W76-08381 4A

Flood Plain Information: Saline River and Tributaries, Benton, Arkansas.
W76-08389 4A

Flood Plain Information: Colorado River and Rifle, Government, Hubbard Gulch Creeks, Rifle, Colorado.
W76-08390 4A

FLOOD PROFILES
Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

Flood Plain Information: Alamo and Ulatis Creeks, Vacaville, California.
W76-08377 4A

Flood Plain Information: Eel River--Stafford to Holmes, Humboldt County, California,
W76-08378 4A

Flood Plain Information: San Felipe Lake, Pacheco Creek, San Benito County, California.
W76-08379 4A

Flood Plain Information: San Antonio Creek and Tributaries, Vicinity of OJAI, Ventura County, California.
W76-08380 4A

Flood Plain Information: Purgatoire River and Tributaries, Vicinity of Trinidad, Colorado.
W76-08381 4A

Flood Plain Information: Saline River and Tributaries, Benton, Arkansas.
W76-08389 4A

Flood Plain Information: Colorado River and Rifle, Government, Hubbard Gulch Creeks, Rifle, Colorado.
W76-08390 4A

FLOOD PROTECTION
Hydrology of the Three Sinkhole Basins in Southwestern Seminole County, Florida,
W76-08572 4A

FLOOD ROUTING
Preliminary Hydrologic Design of Small Flood Detention Reservoirs,
W76-08731 8B

FLOOD STAGES
Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

Flood Plain Information: San Felipe Lake, Pacheco Creek, San Benito County, California.
W76-08379 4A

Flood Plain Information: Purgatoire River and Tributaries, Vicinity of Trinidad, Colorado.
W76-08381 4A

FLOOD STORAGE
Preliminary Hydrologic Design of Small Flood Detention Reservoirs,
W76-08731 8B

FLOOD WAVES
Dimensionless Solution of Dam-Break Flood Waves,
W76-08343 8B

FLOODING
Carbohydrate Transformation in Wheat and Rye Plants Under Effect of Flooding in the Autumn-Winter Period, (In Russian),
W76-08307 3F

Flood Plain Information: Alamo and Ulatis Creeks, Vacaville, California.
W76-08377 4A

FLOODS
Dimensionless Solution of Dam-Break Flood Waves,
W76-08343 8B

Flood Plain Information: Alamo and Ulatis Creeks, Vacaville, California.
W76-08377 4A

Flood Plain Information: Eel River--Stafford to Holmes, Humboldt County, California,
W76-08378 4A

Flood Plain Information: San Felipe Lake, Pacheco Creek, San Benito County, California.
W76-08379 4A

Flood Plain Information: San Antonio Creek and Tributaries, Vicinity of OJAI, Ventura County, California.
W76-08380 4A

Flood Plain Information: Purgatoire River and Tributaries, Vicinity of Trinidad, Colorado.
W76-08381 4A

Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

Flood Plain Information: Saline River and Tributaries, Benton, Arkansas.
W76-08389 4A

Application of the National Weather Service Flash-Flood Program in the Western Region,
W76-08415 4A

Rainfall and Floods in India During 1974 Southwest Monsoon Period,
W76-08732 2B

FLOODWAY
Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

FLORIDA
Hydrology of the Three Sinkhole Basins in Southwestern Seminole County, Florida,
W76-08572 4A

FLOTATION
Protein and Fat Recovery from Effluents,
W76-08172 5D

Acid Coagulation and Dissolved Air Flotation,
W76-08224 5D

The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

FLOW
Water Volume Transport and Oscillatory Current Flow Through the Straits of Mackinac,
W76-08128 2H

Exit of Ground Waters on Drainage Boundaries,
W76-08750 2F

FLOW AROUND OBJECTS
Suppression of Waves in Slotted-Walled Channel,
W76-08742 8B

FLOW CHARACTERISTICS
Suppression of Waves in Slotted-Walled Channel,
W76-08742 8B

FLOW CONDITIONS
Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

FLOW MEASUREMENT
Measurements of Current Flow During Summer in Lake Huron,
W76-08413 2H

FLOW RATES
Ultrasonic River Flow Measurement,
W76-08241 7B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

FLOW RESISTANCE
Channel Flow Over Permeable Beds of Graded Spheres,
W76-08511 8B

FLOW SYSTEM
Dynamic Response of Aquifer Systems to Localized Recharge,
W76-08520 2F

FLUORIDE REMOVAL
Fluoride Removal: Technology and Cost Estimates,
W76-08703 5D

FLUORIDES
Fluoride Removal: Technology and Cost Estimates,
W76-08703 5D

FOAM SEPARATION
Foam Detoxification of Bleached Kraft Effluent,
W76-08460 5D

FOAMING
Economical Foam Control in Wastewater Treatment Systems,
W76-08249 5D

FOGDRIP
Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

FOOD CHAINS
Cladocera and Gastropoda Population Ecology in the Danube Flood Plain, (In Romanian),
W76-08308 2H

Considerations of Testing the Accumulation of Pesticides by Means of Artificial Food Chains,
W76-08361 5A

Culture and Growth of Northern Anchovy, Engraulis Mordax Larvae,
W76-08432 2L

Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

FOOD PROCESSING INDUSTRY
Utilisation of Blood,
W76-08166 3E

O2 Injection Doubles/Triples Biological Waste Treatment Activity.
W76-08167 5D

Duck-Processing Waste,
W76-08168 3E

Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

Egg-Processing Plant Wastes,
W76-08170 3E

Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

Protein and Fat Recovery from Effluents,
W76-08172 5D

Paunch Handling and Processing Techniques,
W76-08173 3E

Waste Treatment and Control at Live Oak Poultry Processing Plant,
W76-08185 3E

Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

Acid Coagulation and Dissolved Air Flotation,
W76-08224 5D

Morrell Pioneers More Efficient Aeration,
W76-08286 5D

The Influence of Soils and Plant Cover on the Retention and Utilization of Suspended and Dissolved Materials in the Waste Water of a Poultry Processing Plant,
W76-08287 5D

New Approaches Point to Better Economies in Hide Processing,
W76-08288 3E

Coagulation with Chitosan - An Aid to Recovery of By-Products from Egg Breaking Wastes,
W76-08289 5D

Biological Changes in the South St. Paul Sewage Treatment Plant Before and After Treatment with FeCl3 and Nalcolyte 675 Coagulating Agents,
W76-08290 5D

Wastewater Control at Egg Products Plants, Pt. 1-3.
W76-08291 3E

Wastes from the Poultry Processing Industry,
W76-08292 3E

Design and Performance of Physical-Chemical and Activated Sludge Treatment for an Edible Oil Plant,
W76-08293 5D

Changing Hog Hair from Costly Nuisance to Asset.
W76-08297 5D

Recycling of Water in Poultry Processing Plants,
W76-08298 3E

Use, Continued Use, and Reuse of Both Process and Waste Waters in Poultry Processing Operations,
W76-08299 3E

Economics of In-Plant Waste Management in Food Processing,
W76-08300 3E

Water and Waste Management in Poultry Processing,
W76-08428 3E

Rum Distillery Wastes: Laboratory Studies on Aerobic Treatment,
W76-08469 5D

Dewatering Vegetable Waste.
W76-08487 5E

Libby, McNeill Solves an Odor Problem,
W76-08502 5D

Animal Food.
W76-08503 5D

Dry Caustic Peeling of Beets and Carrots Reduces Pollution,
W76-08504 5D

Purification of Waste Water.
W76-08505 5D

FOOD PROCESSING INDUSTSRY

Spray Irrigation of Polutry Processing Wastewater,
W76-08165 5D

FOOD WEBS

Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

Note on the Distribution of Mercury in Fish Species in Three Ohio Lakes,
W76-08441 5C

Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

FORECASTING

Snowmelt-Runoff Model for Stream Flow Forecasts,
W76-08131 2E

One-Dimensional Temperature Predictions in Unsteady Flows,
W76-08738 5B

Numerical Prediction of Thermal-Regime of Rivers,
W76-08739 5B

FOREIGN PROJECTS

Design of Ground-Water Level Observation Network.
W76-08563 4B

FOREST BELTS

Snow-Regulating Role of the Forest Belts in the Steppes of the Krasnoyarsk Krai, (In Russian),
W76-08383 2C

FOREST FERTILIZATION

Effects of Forest Fertilization on Two Southeast Alaska Streams,
W76-08673 5B

FOREST FIRES

Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

FOREST MANAGEMENT

Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

First-Year Water Yield Increase After Forest Cutting: An Alternative Model,
W76-08362 4C

Present and Future Multiple use Demands on the Pinyon-Juniper Type,
W76-08430 4A

Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

FOREST MANAGMENT

Multiple Use Evaluations on Ponderosa Pine Forest Land,
W76-08109 4A

FORESTRY

Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

FORESTS

The Effect of Forest Stands on the Water Content of Rocks of the Loess Cover in the Western Regions of the Northern Black Sea Area, (In Ukranian),
W76-08303 4A

Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

FORT BEND COUNTY (TEX)

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

FOULING

A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part I: Model Studies and Fouling Control Techniques,
W76-08660 8I

FOUNDATION INVESTIGATIONS

Application of the Finite Element Method in Foundation Engineering (Die Anwendung der Methode der Finiten Elemente in der Grundbaupraxis),
W76-08423 8D

FOUNDATIONS

Evaluation of Bentonite Clay for Waterproofing Foundation Walls Below Grade,
W76-08427 8D

FOUR-ELECTRODE CONDUCTIVITY CELL

Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

FRACTURE INTERSECTIONS

Flow Interference Effects at Fracture Intersections,
W76-08335 2F

FRACTURE PERMEABILITY

Flow Interference Effects at Fracture Intersections,
W76-08335 2F

FRANCE

Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

FRANCE (GULF OF FOS)

Planktonic Ecosystems: The Effects of Dystrophic Conditions on Structure and Function in the Gulf of Fos, (In French),
W76-08312 5C

FREEZING
Behaviour of Oil Under Canadian Climatic Conditions. Part 1. Oil on Water Under Ice-Forming Conditions,
W76-08365 5B

FRESHWATER FISH
Weight Loss, Mortality, Feeding, and Duration of Residence of Adult American Shad, Alosa Sapidissima in Fresh Water,
W76-08433 5C

FROTH FLOTATION
The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

Kraft Effluent Treatment by Flotation,
W76-08463 5D

FRY
An Experiment on the Feeding of Fry of Catfish Heteropneustes Fossilis,
W76-08575 2I

FUELS
Refuse into Power,
W76-08693 5D

FUNGI
Role of Vitamins in Bacterial-Plankton Relationships in Littoral Seawater and in Supralittoral Pools: II. Annual Evolution of Organisms Which Produce Vitamin Synthesis, (In French),
W76-08405 5C

GAGING
The Estimation of Local Rainfall by Sample Gauging,
W76-08348 2B

GAGING STATIONS
Interstation Correlation of Peak-Flow Estimates,
W76-08555 4A

GALVESTON COUNTY (TEX)
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

GAMMARUS-BALCANICUS
Ecology and Prospects of Using the Amphipod Gammarus (R.) Balcanicus Schaef, (In Russian),
W76-08410 2I

GASES
Amino Acids and Gases in Some Springs and an Oil Field in California,
W76-08568 4B

GASTROPODS
Cladocera and Gastropoda Population Ecology in the Danube Flood Plain, (In Romanian),
W76-08308 2H

Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

GEOCHEMISTRY
Cultural Impact on the Geochemistry of Sediments in Lake Erie,
W76-08727 2J

GEOLOGIC HISTORY
Artificially Simulating the Geological History of Clay,
W76-08421 8D

GEOLOGY
Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

GEOPHYSICAL RESISTIVITY METER
Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

GEORGIA
Annual Report, Water Resources Research Activities under Public Law 88-379, Fiscal Year 1975.
W76-08163 9D

Pollutant Transport in Natural Streams,
W76-08329 5B

A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

GEOTHERMAL STUDIES
Method for Locating and Evaluating Geothermal Sources of Energy by Sensing Electrostatic Voltage Gradients,
W76-08204 4B

GILLS (CARP)
Toxic Action of Copper on the Gills of Carp (Cyprinus Carpio), (In French),
W76-08260 5C

GLACIAL DAMMING
Oceanographic Conditions During 1973 in Russel Fjord, Alaska,
W76-08525 2L

GLACIERS
Evaluation of Glacier Mass Balance by Observing Variations in Transient Snowline Positions,
W76-08322 2C

Oceanographic Conditions During 1973 in Russel Fjord, Alaska,
W76-08525 2L

GOOSE BARNACLES
Sessile Animals on Tar Globules in the Waters Around the Ryukyu Islands, (In Japanese),
W76-08232 2L

GRANGCOLD PELLETIZING PROCESS
Ims-Grangcold Pelletizing System for Steel Mill Wastes Material,
W76-08491 5D

GRAPHICAL METHODS
Abstract Models of Communities of Aquatic Animals,
W76-08218 8I

GRASSED SPRAYFIELDS
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

GRASSES
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

Bacterial Contamination of Perennial Grasses in Overhead Irrigation with Sewage, (In Russian),
W76-08582 5D

GRASSLANDS
Snow-Regulating Role of the Forest Belts in the Steppes of the Krasnoyarsk Krai, (In Russian),
W76-08383 2C

GRAVITY DAMS
Nonlinear Earthquake Response of Concrete Gravity Dams,
W76-08426 8F

GRAZING
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

GREAT LAKES
Water Volume Transport and Oscillatory Current Flow Through the Straits of Mackinac,
W76-08128 2H

Lake Huron Surface Water Temperature, May-November, 1966,
W76-08141 2H

Water Quality Criteria for Great Lakes Waters to be Used as Municipal and Industrial Water Supplies,
W76-08363 5D

Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

GREAT PLAINS
Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

Great Plains Evapotranspiration by a Resistance Model Using Remotely Sensed Thermal Imagery,
W76-08585 2D

GREECE
Research Studies on the Fauna of the Greek Subterranean Waters, (In French),
W76-08296 2L

GREECE (EUBOEA GULF REGION)
Marine Ecology of the Northern Euboea: I. Preliminary Data on the Zooplankton and the Ichtyoplankton, (In French),
W76-08106 2L

GREEN-AMPT EQUATION
Infiltration into Increasingly Permeable Soils,
W76-08516 2G

GREENLAND
On a Thermal Lag in the North Atlantic Ocean During a Climatic Change,
W76-08127 2L

GROUND WATER FLOW
Ground Water Flow No Longer a Mystery,
W76-08114 2F

GROUNDWATER
Water Supply.
W76-08153 4A

Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

Staffliners Prevent Contaminants from Polluting Ground Water at Industrial Waste Treatment Center.
W76-08466 5D

Geology and Water Resources of Marshall County, South Dakota--Part 1: Geology and Water Resources,
W76-08558 4A

Plutonium Radionuclides in the Groundwaters at Enewetak Atoll,
W76-08607 5B

Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

GROUNDWATER MANAGEMENT
Artificial-Recharge Experiments in the Alluvial Aquifer South of Fountain, El Paso County, Colorado,
W76-08571 4B

GROUNDWATER MOVEMENT
An Integrated Finite Difference Method for Analyzing Fluid Flow in Porous Media,
W76-08123 2F

Drainage Runoff of the Groundwater Unsteady Flow to the Drains (Drenazny Odtok Pri Neustalenom Prudeni Podzemnej Vody K Drenom),
W76-08239 4B

Flow Interference Effects at Fracture Intersections,
W76-08335 2F

Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

Transient Aquifer Flows by Characteristics Method,
W76-08513 2F

Transfer of Boron and Tritiated Water Through Sandstone,
W76-08547 5B

Amino Acids and Gases in Some Springs and an Oil Field in California,
W76-08568 4B

Exit of Ground Waters on Drainage Boundaries,
W76-08750 2F

GROUNDWATER OUTCROP-EROSION MODEL (GOEM)
The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

GROUNDWATER POTENTIAL
Ground Water Flow No Longer a Mystery,
W76-08114 2F

GROUNDWATER RECHARGE
Ground Water Flow No Longer a Mystery,
W76-08114 2F

Artificial-Recharge Experiments in the Alluvial Aquifer South of Fountain, El Paso County, Colorado,
W76-08571 4B

GROUNDWATER RESOURCES
Selected Hydrologic Data, Chester County, Pennsylvania,
W76-08557 7C

Design of Ground-Water Level Observation Network.
W76-08563 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

GROWTH
Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

GROWTH RATES
Age Composition and Growth of Aspius Aspius (L.) in the Lower Volga, (In Russian),
W76-08255 2I

Introduction to Hydrobiology. Hydrobiology: A Compendium for Engineers and Natural Scientists, (In German),
W76-08315 5C

Rearing the Sevan Trout at the Aigerlich Trout Pond Fishery, (In Armenian),
W76-08371 2I

Culture and Growth of Northern Anchovy, Engraulis Mordax Larvae,
W76-08432 2L

Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

The Effects of Lindane on the Morphology and the Growth of Some Unicellular Organisms, (In French),
W76-08676 5C

GROWTH STAGES
The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

GROWTH STIMULATION
Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

GULF OF MAINE
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

GULF OF MEXICO
Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

GULF OF ST. LAWRENCE
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

Surface Circulation Pattern in the Gulf of St. Lawrence,
W76-08126 2L

GULFS
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

Surface Circulation Pattern in the Gulf of St. Lawrence,
W76-08126 2L

Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

HAIL
Design of an Experiment to Suppress Hail in Illinois,
W76-08330 3B

HAIL SUPPRESSION
Design of an Experiment to Suppress Hail in Illinois,
W76-08330 3B

HAIR HYDROLYZER
Changing Hog Hair from Costly Nuisance to Asset.
W76-08297 5D

HARBORS
Numerical Computation of Two-Dimensional Flows,
W76-08341 2L

HARRIS COUNTY (TEX)
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

HATCHING
Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

HAWAII
Thermal-Hydraulic Model Study of Offshore Discharge System for Kahe Power Plant, Hawaii,
W76-08508 5B

HEAT FLOW
Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

HEAT STORAGE
Lake Huron Surface Water Temperature, May-November, 1966,
W76-08141 2H

HEAT TRANSFER
One-Dimensional Temperature Predictions in Unsteady Flows,
W76-08738 5B

Numerical Prediction of Thermal-Regime of Rivers,
W76-08739 5B

HEATED WATER
Thermal-Hydraulic Model Study of Offshore Discharge System for Kahe Power Plant, Hawaii,
W76-08508 5B

HEAVING
Properties of Expansive Clay Soils; Report 2, A Numerical Procedure for Predicting Heave with Time,
W76-08420 8D

HEAVY METAL REMOVAL
Sewage Cleaned with Coal,
W76-08263 5D

HEAVY METALS
Removing Heavy Metal Ions from Water,
W76-08401 5D

Removal of Heavy Metal Ions from Wastewater,
W76-08402 5D

Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

The Influence of Water Quality on Accumulation of Heavy Metals in Aquatic Organisms,
W76-08456 5C

Heavy Metal Salts Recovery.
W76-08490 5D

Effluent Water Treatment.
W76-08494 5D

Distribution and Movement of Zinc and Other Heavy Metals in South San Francisco Bay, California,
W76-08561 5B

Study of the Effectiveness of Removing Heavy Metals in Biological Purification of Municipal Sewage, (In Russian),
W76-08580 5D

HEMP LEAVES
Change of the Content and State of Pigments in Leaves of Male and Female Hemp in Relation to Nutrition and Soil Moisture Content, (In Russian),
W76-08306 2I

HETEROTROPHIC BACTERIA
Effect of Crude Oil on Populations of Bacteria and Algae in Artificial Ponds Subject to Winter Weather and Ice Formation,
W76-08453 5C

HIDE PROCESSING INDUSTRY
New Approaches Point to Better Economies in Hide Processing,
W76-08288 3E

HIDE PROCESSOR
Alternatives for Reducing Water Pollution in Cattlehide Processing and Tanning,
W76-08285 3E

HOG PROCESSING WASTES
Changing Hog Hair from Costly Nuisance to Asset.
W76-08297 5D

HOOGHLY ESTUARY (INDIA)
Numerical Computation of Two-Dimensional Flows,
W76-08341 2L

HUDSON RIVER
An Optimization Model for Regional Water Quality Management,
W76-08104 5G

Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

Status of Air Bubble Fish Protection System at Indian Point Station on the Hudson River,
W76-08657 8I

HUMIDITY
Moisturizing Apparatus for Use with Wind Machines,
W76-08399 3F

HYDRAULIC CONDUCTIVITY
Calculating the Unsaturated Hydraulic Conductivity and Diffusivity,
W76-08142 2G

HYDRAULIC DESIGN
Graphic Determination of Sub-Main Pipe Size for Solid-Set Sprinkler Irrigation on Steep, Non-Uniform Slopes,
W76-08682 3F

HYDRAULIC EQUIPMENT
Fish Passage Through Turbines, Conduits, and Spillway Gates,
W76-08651 8I

Conventional Fish Screening Systems and Some Promising Alternatives,
W76-08655 8I

HYDRAULIC MODELS
Hydraulic Model Vortex Study-Grand Coulee Third Powerplant,
W76-08113 8B

Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

Arching of Fragmented Ice Covers,
W76-08149 2C

Thermal-Hydraulic Model Study of Offshore Discharge System for Kahe Power Plant, Hawaii,
W76-08508 5B

HYDRAULIC PROPERTIES
Complex Width-Discharge Relations in Natural River Sections,
W76-08735 2E

HYDRAULIC SIMILITUDE
Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

HYDRAULIC TURBINES
Field Evaluation Testing of Reverse Osmosis High Pressure Pumps and Energy Recovery Turbines.
W76-08372 3A

HYDRAULICS
Perforated-Pipe Water Intake for Fish Protection,
W76-08137 8I

Channel Flow Over Permeable Beds of Graded Spheres,
W76-08511 8B

HYDROBIOLOGY
Introduction to Hydrobiology. Hydrobiology: A Compendium for Engineers and Natural Scientists, (In German),
W76-08315 5C

HYDRODYNAMICS
Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

HYDROGEN PEROXIDE PICKLING
Pickling with Hydrogen Peroxide Solutions,
W76-08479 5D

HYDROGEOLOGY
The Effect of Mineral Environment on the Geohydrological Situation in Low Bog Sites, (In German),
W76-08184 2H

Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

HYDROGRAPHS
About the Problem of Direct Runoff Determination by Separation of the Hydrograph Components (K Otazke Urcenia Primaeho Odtoku Separaciou Prietokovych Vln),
W76-08238 2A

HYDROLOGIC ASPECTS
Drainage Runoff of the Groundwater Unsteady Flow to the Drains (Drenazny Odtok Pri Neustalenom Prudeni Podzemnej Vody K Drenom),
W76-08239 4B

Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

Effects of Hydrologic Regime on Magnitude and Frequency of Dominant Discharge,
W76-08514 2E

HYDROLOGIC BUDGET
Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

Water Use by Saltcedar as Measured by the Water Budget Method,
W76-08573 2D

A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

Preliminary Hydrologic Design of Small Flood Detention Reservoirs,
W76-08731 8B

HYDROLOGIC DATA
Evaluation of ERTS Data for Certain Hydrological Uses,
W76-08147 7C

Impact of Remote Sensing Upon the Planning, Management, and Development, and Development of Water Resources,
W76-08536 6B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

HYDROLOGIC DESIGN
Preliminary Hydrologic Design of Small Flood Detention Reservoirs,
W76-08731 8B

HYDROLOGIC REGIME
Effects of Hydrologic Regime on Magnitude and Frequency of Dominant Discharge,
W76-08514 2E

HYDROLOGIC SYSTEMS
An Optimization Technique Adapted to USDAHL-74 Revised Model of Watershed Hydrology,
W76-08523 2A

HYDROLOGICAL ASPECTS
Influence of the Local Precipitation Quantity on the Loading of Water Bodies with Mixed Water (Der Einfluss der Oertlichen Neiderschlagshoehe auf die Belastung der Gewaesser Mit Mischwasser),
W76-08258 5B

HYDROLOGY
The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

ICE COVER
Arching of Fragmented Ice Covers,
W76-08149 2C

ICHTHYO PLANKTON
Marine Ecology of the Northern Euboea: I. Preliminary Data on the Zooplankton and the Ichtyoplankton, (In French),
W76-08106 2L

IGNITION METHOD
An Ignition Method for Determination of Total Phosphorus in Lake Sediments,
W76-08346 5A

ILLINOIS
Design of an Experiment to Suppress Hail in Illinois,
W76-08330 3B

Soil Loss from Illinois Farms - Economic Analysis of Productivity Loss and Sedimentation Damage,
W76-08533 4D

IMMATURE GROWTH STAGE
Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

IMPERIAL VALLEY (CALIF)
Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

IMPOUNDMENTS
On-Site Runoff Depletion at Three Impoundments,
W76-08122 4A

Self-Purification Capacity of Impoundments,
W76-08358 5C

INCINERATION
Catalytic Filtering-Incinerating Process and Device for Waste Water,
W76-08400 5D

New Incineration Method Solves Grease Problem in Richmond, Pa.,
W76-08485 5E

Slurry-Burning Process.
W76-08498 5D

Refuse into Power,
W76-08693 5D

INDIA
Rainfall and Floods in India During 1974 Southwest Monsoon Period,
W76-08732 2B

Extreme Rainfall Studies of the Brahmani, The Burhabalang, The Rushikulya and the Subarnarekha River Catchments,
W76-08733 2B

Measurement of Soil Moisture in Poona Black Cotton Soil Using an Infra-Red Moisture Balance,
W76-08734 2G

INDUSTRIAL WASTES
Paunch Handling and Processing Techniques,
W76-08173 3E

Waste Treatment and Control at Live Oak Poultry Processing Plant,
W76-08185 3E

Water Pollution Abatement Technology, Capabilities and Costs, Textile Industry.
W76-08186 5G

Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

Capabilities and Costs of Technology for the Organic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08188 5G

Capabilities and Costs of Technology for the Inorganic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08189 5G

Water Pollution Abatement Technology: Costs and Capabilities Petroleum Refining Industry, Part 1, Chapters -V.
W76-08190 5G

Water Pollution Abatement Technology: Costs and Capabilities, Petroleum Refining Industry, Part 2, Chapters VI - IX.
W76-08191 5G

Zero Effluent System.
W76-08267 5D

Efficient Chemical Method for the Treatment of Zinc Manufacturing Plant Generated Waste Waters (Effektivnyy khimicheskikh sposob ochistki stochnykh vod tsinkovogo zavoda),
W76-08268 5D

Chemfix Treatment System for Liquid and Sludge Effluents.
W76-08269 5D

Cyanide Treatment in the Metal Finishing Industry,
W76-08271 5D

Process for Purification of Industrial Waste Waters from Perchlorates and Chlorates,
W76-08395 5D

Removal of Heavy Metal Ions from Wastewater,
W76-08402 5D

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

The Control of Chloride Ions in the MgO Recovery System,
W76-08457 5D

Toxic Constituents in Pulp Mill Effluents,
W76-08458 5A

Method and Apparatus for the Destructive Decomposition of Organic Wastes Without Air Pollution and With Recovery of Chemical Byproducts,
W76-08459 5D

Foam Detoxification of Bleached Kraft Effluent,
W76-08460 5D

Detoxification of Bleached Kraft Mill Effluents,
W76-08461 5D

Paper Pulp Effluent Purification.
W76-08462 5D

Kraft Effluent Treatment by Flotation,
W76-08463 5D

The Effects of High Sodium Chloride Concentrations and High Pollutant Loads on the Composition of the Activated Sludge Microflora in the Treatment of Petroleum Refinery-Generated Effluents (Wplyw wysokiego Stezenia Chlorku Sodowego I Duzego Ladunku Zanieczyszczen Na Sklad Milroflory Osadu Czynnego Przy Oczyszczaniu Sciekow Rafineryjno-Petrochemicznych).
W76-08464 5D

Effluent Treatment in Selected Organic Chemical Factories,
W76-08465 5D

Staffliners Prevent Contaminants from Polluting Ground Water at Industrial Waste Treatment Center.
W76-08466 5D

Recovery and Separation of Chemicals Produced During Kraft Pulping Operations,
W76-08467 5D

Land Treatment of Food Processing Wastewaters,
W76-08468 5E

Rum Distillery Wastes: Laboratory Studies on Aerobic Treatment,
W76-08469 5D

A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

Treatment of Photographic Ferrocyanide-Type Bleach Solutions for Reuse and Disposal,
W76-08472 5D

Industrial Effluent Treatment,
W76-08473 5D

Crude Soap Recovers Mercury from Water,
W76-08474 5D

Treatment Method for Oil-Containing Liquid Waste (Ganyu haisui shoriho),
W76-08475 5D

Elimination Method for Mercury Residue in Water (Suichu yozon suigin no jokyoho),
W76-08476 5D

Updating an Existing Pollution Control Facility at Western Electric,
W76-08477 5D

Plating Waste Recovery Unit,
W76-08478 5D

Pickling with Hydrogen Peroxide Solutions,
W76-08479 5D

Water Treatment System Saves 45,000 Gals Daily.
W76-08480 5D

Cooperation Helps Erie,
W76-08481 5D

Pollution Problem Solver,
W76-08483 5D

Removal of Oil Pollution.
W76-08484 5D

New Incineration Method Solves Grease Problem in Richmond, Pa.,
W76-08485 5E

Reverse Osmosis System Corrects High BOD Wastes: Yields Net Operating Savings,
W76-08486 5D

Dewatering Vegetable Waste.
W76-08487 5E

Fiber Recovery Increases Water Re-Use, Reduces Treatment Cost,
W76-08489 5D

Heavy Metal Salts Recovery.
W76-08490 5D

Ims-Grangcold Pelletizing System for Steel Mill Wastes Material,
W76-08491 5D

Treating Waste Liquors Containing Metal-Working Oil Emulsions.
W76-08492 5D

Metallic Recovery System,
W76-08493 5D

Effluent Water Treatment.
W76-08494 5D

Settling Tank,
W76-08495 5D

Sour Water Treatment Process.
W76-08496 5D

Removing Fine Plastic Particles From Waste Water.
W76-08497 5D

Slurry-Burning Process.
W76-08498 5D

Determination of Traces of Carbon in Solid and Liquid Wastes of Chemical Plants by Means of Thermal Conductivity Measurements (Bestimmung Von Spuren Kohlenstoff in Festen Und Fluessigen Abfallstoffen Der Chemischen Industrie Mit Hilfe Der Waermeleitfaehigkeitsmessung),
W76-08499 5A

Rapson Idea Set for Mill Trials.
W76-08500 5D

Determining Oil Content, in Water.
W76-08501 5A

Libby, McNeill Solves an Odor Problem,
W76-08502 5D

Animal Food.
W76-08503 5D

Dry Caustic Peeling of Beets and Carrots Reduces Pollution,
W76-08504 5D

Purification of Waste Water.
W76-08505 5D

Sulphuric Acid Containing Rinses, Purification,
W76-08506 5D

Pressurized Oxidation of Pulp Spent Liquor (Parupu haieki no kaatsu snaka),
W76-08696 5D

The Long Hard Road to the Effluent-Free Pulp Mill,
W76-08698 5D

Biological Processes for Effluent and Waste Treatment Exemplified by the Paper Industry (Biologische Verfahren Zur Abwasser- Und Abfallaufbereitung am Beispiel der Paper-Industrie),
W76-08699 5D

The Effluent Treatment System and Utilization of Recycled Water in the Iyomishima Mill (Daio seishi Mishima kojo ni okeru sogo haisui shori to haisui no sairiyo),
W76-08700 5D

Recycling--Examples for Its Possibilities and Limits (Recycling--Beispiele fuer Moeglichkeiten und Grenzen),
W76-08701 5D

Chemical Clarification of Waste Water.
W76-08702 5D

Fluoride Removal: Technology and Cost Estimates,
W76-08703 5D

The Effective Management of Waste.
W76-08704 5D

Purifying-Demicrobising Waste-Water.
W76-08705 5D

The Electrolytic Processing of Cyanide Wastes,
W76-08706 5D

Studies Concerning Oil Removal from Mill Scale (Untersuchungen Zur Entoelung Von Walzzunder),
W76-08707 5D

Clearing of Titanium- and Aluminium-Containing Effluent Waters.
W76-08708 5D

Electrolytic Purification of Trade Effluents Containing Toxic Materials,
W76-08709 5D

High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

Industrial Waste Treatment System Reduces Pollution,
W76-08711 5D

Municipal Industrial Waste Program Nets $8.9 Million in Two Years.
W76-08712 5D

Industry Takes the Lead in Cleaning Up the Rhine.
W76-08713 5D

Austrian Experiences Concerning Damages of Communal Purification Facilities by Industrial Effluents (Osterreichische Erfahrungen Betreffend Schaden an Kommunalen Klaranlagen Durch Industrieabwasser).
W76-08714 5D

Oxygen, and Other Innovations, Help Lick Tough Waste Problem,
W76-08715 5D

Treatment of Dye Wastes with Granular Activated Carbon,
W76-08716 5D

A Modified Raw-Wool Scouring System for Easier Effluent Treatment,
W76-08717 5D

Canton's Futuristic Waste Treatment System,
W76-08720 5D

Re-Use and Disposal of Waste Acids,
W76-08721 5D

Methane Fermentation of Rubber (Hevea Brasiliensis) Latex Effluent,
W76-08722 5D

INDUSTRIES

Environmental Quality and Inflation: A Regional Perspective on the Cost-Push Impact of the 1972 Pure Water Legislation,
W76-08151 5G

INFILTRATION

Town Halts Infiltration.
W76-08257 5D

INFILTRATION

Infiltration Analysis and Perturbation Methods 1. Absorption with Exponential Diffusivity,
W76-08334 2G

How Much Precipitation Goes to Infiltration During a Storm Period,
W76-08339 2A

Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

Infiltration into Increasingly Permeable Soils,
W76-08516 2G

INFILTRATION CAPACITY

Infiltration into Increasingly Permeable Soils,
W76-08516 2G

INFILTRATION RATES

Infiltration into Increasingly Permeable Soils,
W76-08516 2G

INFLATION (ECONOMIC)

Environmental Quality and Inflation: A Regional Perspective on the Cost-Push Impact of the 1972 Pure Water Legislation,
W76-08151 5G

INFORMATION RETRIEVAL

Updating the Navy Environmental Protection Data Base to Incorporate Oil Spill Clean-Up Performance,
W76-08320 5B

INFRARED RADIATION

Canopy Temperature Measurement of Sorghum and Millet with Leaf Thermocouple and Infrared Thermometer Techniques,
W76-08590 2D

INFRARED SPECTROSCOPY

Soil Stabilization with Powdered and Coarse Quicklime,
W76-08422 8D

INHIBITION

Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

INORGANIC CHEMICALS INDUSTRY

Capabilities and Costs of Technology for the Inorganic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08189 5G

INORGANIC COMPOUNDS

Capabilities and Costs of Technology for the Inorganic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08189 5G

INPUT PARAMETERS

An Optimization Technique Adapted to USDAHL-74 Revised Model of Watershed Hydrology,
W76-08523 2A

INSECTS

An Aquatic Technique for Collecting Small Adult Insects,
W76-08574 7B

INSTITUTIONAL CONSTRAINTS

Water Pollution Control Act of 1972, Institutional Assessment, Planning.
W76-08192 5G

The Water Pollution Control Act of 1972 Institutional Assessment, Attitudes of Participants.
W76-08221 5G

Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

A Framework for Evaluating Institutional and Socio-Economic Issues of Land Treatment of Waste Water,
W76-08681 5D

INSTRUMENTATION

Ultrasonic River Flow Measurement,
W76-08241 7B

Rain Gauge,
W76-08397 2B

INTAKES STRUCTURES

Perforated-Pipe Water Intake for Fish Protection,
W76-08137 8I

INTEGRATED FINITE DIFFERENCE METHOD

An Integrated Finite Difference Method for Analyzing Fluid Flow in Porous Media,
W76-08123 2F

INTER-AGENCY COOPERATION

Intercalibration of Methods for Radionuclide Measurements on a Seaweed Sample,
W76-08626 5A

INTERCEPTOR SEWERS

Fast Replacement of a Flood-Damaged Interceptor,
W76-08240 8F

INTERNAL PERFORATED SLEEVE

Perforated-Pipe Water Intake for Fish Protection,
W76-08137 8I

INVERTEBRATES

Models of Populations of Aquatic Invertebrates,
W76-08217 8I

IODINE

A Review of Methods for the Determination of Iodine-131 in the Marine Environment,
W76-08622 5A

A Rapid Method for the Determination of Radioiodine in Suspended Matter and Seawater,
W76-08623 5A

A Method for the Rapid Enrichment and Determination of Silver-110m and Iodine-131 from Seawater,
W76-08624 5A

ION EXCHANGE

Solid Mineral and Regenerant Recovery for Ion-Exchange Resins,
W76-08199 3A

Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

Water Treatment System Saves 45,000 Gals Daily.
W76-08480 5D

Sulphuric Acid Containing Rinses, Purification,
W76-08506 5D

Radiochemical Determination of Plutonium in Marine Samples by Ion Exchange and Solvent Extraction,
W76-08614 5A

IONS

Effluent Water Treatment.
W76-08494 5D

IOWA

Identification, Measurement, and Incorporation of Environmental Quality Objectives in Natural Resource Development,
W76-08101 6B

Efficient Resource Utilization Within a Regional Framework.
W76-08102 6B

Coralville Water Quality Study, Annual Report, Water Year October 1, 1974 to September 30, 1975,
W76-08324 5A

IOWA RIVER (IOWA)

Coralville Water Quality Study, Annual Report, Water Year October 1, 1974 to September 30, 1975,
W76-08324 5A

IRON

Absorptiometric Determination of Iron with T.P.T.Z.,
W76-08273 5A

Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

IRON COMPOUNDS

Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

IRRIGATION

Irrigation Signalling Device,
W76-08196 3F

Adjustable Soaker Hose Support Assembly,
W76-08197 3F

Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

Ground Treatment Apparatus,
W76-08393 3F

Irrigation System (Lifting Dogs),
W76-08398 3F

Underground Irrigation System,
W76-08406 3F

Self Propelled Sprinkling Irrigation Apparatus,
W76-08407 3F

Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

Planning Irrigation and Drainage Systems Using Retention and Extraction Limits,
W76-08553 3F

Graphic Determination of Sub-Main Pipe Size for Solid-Set Sprinkler Irrigation on Steep, Non-Uniform Slopes,
W76-08682 3F

IRRIGATION DISTRICTS
Economic Evaluation of Proposed Water Conservation Practices on Established Irrigation Districts: A General Methodology and Application to Three Districts in Oregon,
W76-08431 3F

IRRIGATION EFFECTS
Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

Bacterial Contamination of Perennial Grasses in Overhead Irrigation with Sewage, (In Russian),
W76-08582 5D

Water Quality in Irrigated Watersheds,
W76-08679 5B

IRRIGATION EFFICIENCY
Adjustable Soaker Hose Support Assembly,
W76-08197 3F

Underground Irrigation System,
W76-08406 3F

Self Propelled Sprinkling Irrigation Apparatus,
W76-08407 3F

IRRIGATION ENGINEERING
Graphic Determination of Sub-Main Pipe Size for Solid-Set Sprinkler Irrigation on Steep, Non-Uniform Slopes,
W76-08682 3F

IRRIGATION OPERATION AND MANAGEMENT
Irrigation System Management for Reducing Peak Electrical Demands,
W76-08549 3F

IRRIGATION PRACTICES
Irrigation Signalling Device,
W76-08196 3F

Adjustable Soaker Hose Support Assembly,
W76-08197 3F

Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

Ground Treatment Apparatus,
W76-08393 3F

Irrigation System (Lifting Dogs),
W76-08398 3F

Self Propelled Sprinkling Irrigation Apparatus,
W76-08407 3F

Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

Bacterial Contamination of Perennial Grasses in Overhead Irrigation with Sewage, (In Russian),
W76-08582 5D

IRRIGATION SYSTEMS
Ground Treatment Apparatus,
W76-08393 3F

Irrigation System (Lifting Dogs),
W76-08398 3F

Underground Irrigation System,
W76-08406 3F

Self Propelled Sprinkling Irrigation Apparatus,
W76-08407 3F

IRRIGATION WATER
A Comparative Study of the Effect of Qualities of Irrigation Water on Different Soils,
W76-08301 3C

The Impact of Molybdenum-Enriched Irrigation Water on Agricultural Soils Near Brighton, Colorado,
W76-08675 5B

ISOPODS
Research Studies on the Fauna of the Greek Subterranean Waters, (In French),
W76-08296 2L

ISRAEL
Design of Ground-Water Level Observation Network.
W76-08563 4B

ITALY (LAKE ENDINE)
An Ecologic Survey of Lake Endine, (In Italian),
W76-08244 5C

JAMAICA BAY (NY)
Shooting Models for Salinity and Coliform,
W76-08134 5B

A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

JAPAN
A Study on Marine Trace Elements and CSK Standards, (In Japanese),
W76-08311 2L

JAPAN (RYUKU ISLANDS)
Sessile Animals on Tar Globules in the Waters Around the Ryukyu Islands, (In Japanese),
W76-08232 2L

JETTIES
Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

JUNIPER TREES
Pinyon-Juniper Control--Does it Pay,
W76-08110 4A

KANSAS
Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

KARST HYDROLOGY
Hydrology of the Three Sinkhole Basins in Southwestern Seminole County, Florida,
W76-08572 4A

KIEL BIGHT (GERMANY)
The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

KINETICS
Use of Crushed Limestone to Neutralize Acid Wastes,
W76-08225 5G

The Kinetics of Microbial Nitrification,
W76-08369 5D

LABORATORY TESTS
Perforated-Pipe Water Intake for Fish Protection,
W76-08137 8I

Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

LAKE CHAPALA (MEXICO)
Distributions of BOD and Do In Rivers and Lakes,
W76-08743 5B

LAKE DALNY (USSR)
Models of Actual Communities,
W76-08219 8I

LAKE ERIE
Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

Sediment Yields and Nutrient Loadings from Canadian Watersheds Tributary to Lake Erie: An Overview,
W76-08529 5B

Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

Computations of Physical Transport and Regeneration of Phosphorus in Lake Erie, Fall 1970,
W76-08531 5B

Continuous Dynamical Computations of Water Transports in Lake Erie for 1970,
W76-08724 2H

Surficial Sediments of Lake Erie,
W76-08725 2J

Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

Cultural Impact on the Geochemistry of Sediments in Lake Erie,
W76-08727 2J

LAKE ERIE BASIN
Lake Erie and Its Basin,
W76-08723 2H

LAKE GEORGE (NY)
Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

LAKE HURON
Water Volume Transport and Oscillatory Current Flow Through the Straits of Mackinac,
W76-08128 2H

Lake Huron Surface Water Temperature, May-November, 1966,
W76-08141 2H

LAKE HURON

Measurements of Current Flow During Summer in Lake Huron,
W76-08413 2H

Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

LAKE ICE
The Study of Fresh-Water Lake Ice Using Multiplexed Imaging Radar,
W76-08138 2C

LAKE MICHIGAN
Water Volume Transport and Oscillatory Current Flow Through the Straits of Mackinac,
W76-08128 2H

Electrophysiological Studies of Morpholine-Imprinted Coho Salmon (Oncorhynchus Kisutch) and Rainbow Trout (Salmo Gairdneri),
W76-08438 5C

Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

Baseline Concentrations of Polychlorinated Biphenyls and DDT in Lake Michigan Fish, 1971,
W76-08685 5A

LAKE MORPHOLOGY
Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

LAKE MORPHOMETRY
Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

LAKE ONTARIO
The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

Eastern Lake Ontario Precipitation Network,
W76-08412 2B

LAKE RAZDELNY (KARELIAN ISTMUS). U.S.S.R
Models of Actual Communities,
W76-08219 8I

LAKE SEDIMENTS
An Ignition Method for Determination of Total Phosphorus in Lake Sediments,
W76-08346 5A

Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

Sediment Yields and Nutrient Loadings from Canadian Watersheds Tributary to Lake Erie: An Overview,
W76-08529 5B

Surficial Sediments of Lake Erie,
W76-08725 2J

Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

Cultural Impact on the Geochemistry of Sediments in Lake Erie,
W76-08727 2J

LAKE SHORES
The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

LAKE STAGES
Hydrology of the Three Sinkhole Basins in Southwestern Seminole County, Florida,
W76-08572 4A

LAKE SUPERIOR
The Study of Fresh-Water Lake Ice Using Multiplexed Imaging Radar,
W76-08138 2C

LAKES
Steady Stratified Circulation in a Cavity,
W76-08136 2H

Data on Selected Lakes in Washington, Part 3,
W76-08564 2H

Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

LAMINAR FLOW
Momentum Transfer in Hydrodynamically Developing Laminar Flow in a Straight Channel,
W76-08318 8B

LAND APPLICATION
Oxygen Relationships in a Soil Treated with Sewage Effluent,
W76-08231 5D

LAND CLASSIFICATION
The Relationship Between Watershed Use and Stream Water Quality,
W76-08282 4D

LAND MANAGEMENT
Innovative Technologies for Water Pollution (Abatement).
W76-08220 5G

A Framework for Evaluating Institutional and Socio-Economic Issues of Land Treatment of Waste Water,
W76-08681 5D

LAND USE
Land Use and Water Quality in New York Rivers,
W76-08133 5B

Land-Use Model For Service Area Projection,
W76-08226 5G

Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

The Relationship Between Watershed Use and Stream Water Quality,
W76-08282 4D

Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

Environmental Monitoring from Spacecraft Data,
W76-08532 5A

Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

LAND USE PLANNING
Water Pollution Control Act of 1972, Institutional Assessment, Planning.
W76-08192 5G

LANDSAT
Environmental Monitoring from Spacecraft Data,
W76-08532 5A

LARVAL GROWTH
Effects of Temperature and Salinity on the Survival of Winter Flounder Embryos,
W76-08437 5C

LARVAL GROWTH STAGE
Culture and Growth of Northern Anchovy, Engraulis Mordax Larvae,
W76-08432 2L

LAS ANIMAS COUNTY (CO)
Flood Plain Information: Purgatoire River and Tributaries, Vicinity of Trinidad, Colorado.
W76-08381 4A

LASER RAMAN SPECTROSCOPY
Detection of Salts of 2,4-D in Aqueous Solution by Laser Raman Spectroscopy,
W76-08254 5A

LASERS
Laser Applications to Atmospheric Sciences - A Bibliography,
W76-08323 10C

LEACHING
The Nitrogen Balance of Arctic Tundra: Pathways, Rates, and Environmental Implications,
W76-08678 5B

Nitrate, Phosphate, and Potassium Movement into Drainage Lines under Three Soil Management Systems,
W76-08680 5B

LEAKY AQUIFERS
Transient Aquifer Flows by Characteristics Method,
W76-08513 2F

LEAVES
Soil Moisture Regime and Pigment Content in Leaves of Cereals, (In Belorussian),
W76-08304 3F

Change of the Content and State of Pigments in Leaves of Male and Female Hemp in Relation to Nutrition and Soil Moisture Content, (In Russian),
W76-08306 2I

LEMNA MINOR
Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

LENZINGER PROCESS
Recycling--Examples for Its Possibilities and Limits (Recycling--Beispiele fuer Moeglichkeiten und Grenzen),
W76-08701 5D

LETHAL LIMIT
The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

LIME
Fluoride Removal: Technology and Cost Estimates,
W76-08703 5D

LIMESTONES
Use of Crushed Limestone to Neutralize Acid Wastes,
W76-08225 5G

LIMING
A Very Rapid Liming and Tanning Process Without Effluent,
W76-08181 3E

LIMITING FACTORS
Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

LINDANE
The Effects of Lindane on the Morphology and the Growth of Some Unicellular Organisms, (In French),
W76-08676 5C

LINEARIZATION
Transient Free Surface Flow to a Well: An Analysis of Theoretical Solutions,
W76-08333 2F

LININGS
Staffliners Prevent Contaminants from Polluting Ground Water at Industrial Waste Treatment Center.
W76-08466 5D

LITTORAL
Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

LITTORAL DRIFT
Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

LOAM
Thermal Properties of Fine Textured Mollisols Under Varying Moisture Conditions,
W76-08364 2G

LOCK CHAMBER HYDRAULICS
Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

LOESS
The Effect of Forest Stands on the Water Content of Rocks of the Loess Cover in the Western Regions of the Northern Black Sea Area, (In Ukranian),
W76-08303 4A

LONG ISLAND (NY)
Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

LOS ANGELES COUNTY (CALIF)
DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

LOW PRESSURE MEMBRANES
Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

LUBBOCK (TEX)
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

LYSIMETERS
Great Plains Evapotranspiration by a Resistance Model Using Remotely Sensed Thermal Imagery,
W76-08585 2D

MAD RIVER (CALIF)
Water Quality in the Mad River Basin, Humboldt and Trinity Counties, California,
W76-08562 5A

MAGNETIC FILTRATION
High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

MAINTENANCE
'We've Found a Real Time-Saver',
W76-08251 8C

MALACOPHAGOUS
The Selection of Prey in 3 Malacophagous Fishes of Lake Chad, (In French),
W76-08178 2H

MALATHION
Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

MANAGED ECOSYSTEMS
Natural and Agricultural Ecosystems,
W76-08667 6G

MANAGEMENT
An Optimization Model for Regional Water Quality Management,
W76-08104 5G

Land-Use Model For Service Area Projection,
W76-08226 5G

MANGANESE
Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

MAPPING
Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

MARINE ALGAE
Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

Nitrogen Utilization During Spring Blooms of Marine Phytoplankton in Bedford Basin, Nova Scotia, Canada,
W76-08691 5C

MARINE BIOLOGY
A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

MARINE FISH
Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

Mercury Concentrations in Fish, North Atlantic Offshore Waters--1971,
W76-08360 5A

MARINE GEOLOGY
A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

MARINKA
Some Problems of the Ecology of the Sary-Chilek Marinka Schizothorax Intermedius Eury-Cephalus Spelter, (In Russian),
W76-08243 2H

MARSH CREATION
Guidelines for Material Placement in Marsh Creation,
W76-08325 5G

MARSHALL COUNTY (S DAK)
Geology and Water Resources of Marshall County, South Dakota--Part 1: Geology and Water Resources,
W76-08558 4A

MARSHES
Guidelines for Material Placement in Marsh Creation,
W76-08325 5G

Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

MARYLAND
Preparation of Plans and Specifications for Pollution Abatement Activities in Cherry Creek Watershed, Maryland.
W76-08385 5G

Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

Implementation of Hydrologic Models at Goddard Space Flight Center.
W76-08745 2A

MATHEMATIC STUDIES
Models of Populations of Aquatic Invertebrates,
W76-08217 8I

MATHEMATICAL MODELS
Shooting Models for Salinity and Coliform,
W76-08134 5B

Two-Dimensional Mathematical Water Quality Model,
W76-08135 5B

Development Trends in Methods used to Model Populations and Communities,
W76-08212 8I

Development Trends in Methods Used to Model Populations and Communities,
W76-08213 8I

Theoretical Bases of Modelling of Populations and Communities of Aquatic Animals,
W76-08214 8I

Abstract Models of Fish Populations,
W76-08215 8I

Models of Actual Fish Populations,
W76-08216 8I

Models of Actual Communities,
W76-08219 8I

A Parametric Wave Prediction Model,
W76-08337 2L

Dimensionless Solution of Dam-Break Flood Waves,
W76-08343 8B

A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

Nonlinear Earthquake Response of Concrete Gravity Dams,
W76-08426 8F

Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

Continuous Dynamical Computations of Water Transports in Lake Erie for 1970,
W76-08724 2H

One-Dimensional Temperature Predictions in Unsteady Flows,
W76-08738 5B

Numerical Prediction of Thermal-Regime of Rivers,
W76-08739 5B

Distributions of BOD and Do In Rivers and Lakes,
W76-08743 5B

MATHEMATICAL STUDIES
A Reconsideration of the Fiering Two-Station Model,
W76-08519 4A

MAUMEE RIVER (OHIO)
Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

MAXIMUM ANNUAL PEAK FLOW SERIES
Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

MEASUREMENT
Measurement Method for Dissolved Ammonia Nitrogen in Water (Yozon anmoniasei chisso nodo sokuteiho),
W76-08261 5A

A Simple Continuous-Flow Respirometer for Comparative Respiratory Changes in Medium-Sized Aquatic Organisms,
W76-08353 5C

Measurement of Soil Moisture in Poona Black Cotton Soil Using an Infra-Red Moisture Balance,
W76-08734 2G

MEAT PACKING WASTES
Utilisation of Blood,
W76-08166 3E

Protein and Fat Recovery from Effluents,
W76-08172 5D

Paunch Handling and Processing Techniques,
W76-08173 3E

Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

Acid Coagulation and Dissolved Air Flotation,
W76-08224 5D

Morrell Pioneers More Efficient Aeration,
W76-08286 5D

Biological Changes in the South St. Paul Sewage Treatment Plant Before and After Treatment with FeCl3 and Nalcolyte 675 Coagulating Agents,
W76-08290 5D

MEAT PACKING WASTES PRETREATMENT
Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

MEAT PROCESSING WASTES
O2 Injection Doubles/Triples Biological Waste Treatment Activity.
W76-08167 5D

MECHANICAL EQUIPMENT
Vertical Traveling Fish Basket Collector,
W76-08650 8I

MEDITERRANEAN SEA
On a Thermal Lag in the North Atlantic Ocean During a Climatic Change,
W76-08127 2L

MEMBRANE PROCESSES
Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 1-5 MGD Plants, Plants for High Product Recovery,
W76-08118 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 3-25 MGD Low Pressure Plants,
W76-08119 3A

Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

Development of Assymmetric Cellulose Triacetate Membranes for Seawater Desalination,
W76-08283 3A

Engineering and Economic Study of Reverse Osmosis Sea Water Desalting Plants, Design of 1-10 MGD Seawater Plants,
W76-08284 3A

Field Evaluation Testing of Reverse Osmosis High Pressure Pumps and Energy Recovery Turbines.
W76-08372 3A

Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

MEMBRANES
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

Development of Assymmetric Cellulose Triacetate Membranes for Seawater Desalination,
W76-08283 3A

Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

MENIDIA MENIDIA
Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

MERCURY
Mercury Concentrations in Fish, North Atlantic Offshore Waters--1971,
W76-08360 5A

Note on the Distribution of Mercury in Fish Species in Three Ohio Lakes,
W76-08441 5C

Crude Soap Recovers Mercury from Water,
W76-08474 5D

Elimination Method for Mercury Residue in Water (Suichu yozon suigin no jokyoho),
W76-08476 5D

Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

Reassessment of Mercury in Surface Water in the Adirondack Region, New York,
W76-08554 2K

Chlorinated Hydrocarbon Pesticides and Mercury in Coastal Biota, Puerto Rico and the U.S. Virgin Islands--1972-74,
W76-08683 5B

MESOPELAGIC FISHES
Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

METABOLISM
Some Characteristics of Fat Metabolism in Two Forms of Char Salvelinus Alpinus (L.) From Lake Azabach (Kamchatka), (In Russian),
W76-08310 2H

Introduction to Hydrobiology. Hydrobiology: A Compendium for Engineers and Natural Scientists, (In German),
W76-08315 5C

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

Relation Between Plant Transpiration and Metabolism, (In Russian),
W76-08583 2D

METAL ACCUMULATION
Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

METAL FINISHING INDUSTRY
The Electrolytic Processing of Cyanide Wastes,
W76-08706 5D

METAL FINISHING WASTES
Cyanide Treatment in the Metal Finishing Industry,
W76-08271 5D

Heavy Metal Salts Recovery.
W76-08490 5D

METALLIC SALTS
Effluent Water Treatment.
W76-08494 5D

METALS
Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

Studies Concerning Oil Removal from Mill Scale (Untersuchungen Zur Entoelung Von Walzzunder),
W76-08707 5D

Electrolytic Purification of Trade Effluents Containing Toxic Materials,
W76-08709 5D

Industrial Waste Treatment System Reduces Pollution,
W76-08711 5D

METEOROLOGICAL DATA
Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

METHANE
Methane Fermentation of Rubber (Hevea Brasiliensis) Latex Effluent,
W76-08722 5D

METHOD OF CHARACTERISTICS
Transient Aquifer Flows by Characteristics Method,
W76-08513 2F

METHOD OF IMAGES
Improved Image-Well Technique for Aquifer Analysis,
W76-08517 4B

METHODOLOGY
Development Trends in Methods used to Model Populations and Communities,
W76-08212 8I

Development Trends in Methods Used to Model Populations and Communities,
W76-08213 8I

Theoretical Bases of Modelling of Populations and Communities of Aquatic Animals,
W76-08214 8I

Abstract Models of Fish Populations,
W76-08215 8I

Models of Actual Fish Populations,
W76-08216 8I

Models of Populations of Aquatic Invertebrates,
W76-08217 8I

Abstract Models of Communities of Aquatic Animals,
W76-08218 8I

New Methods for Ecological Analysis of Microorganisms of Eutrophic Waters, (In Spanish),
W76-08252 5A

Determination of Total Nitrogen in Natural Waters,
W76-08355 2K

Improved Image-Well Technique for Aquifer Analysis,
W76-08517 4B

METHYLMERCURY
Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

MEXICO
Distributions of BOD and Do In Rivers and Lakes,
W76-08743 5B

MICHIGAN
The Study of Fresh-Water Lake Ice Using Multiplexed Imaging Radar,
W76-08138 2C

The Relationship Between Watershed Use and Stream Water Quality,
W76-08282 4D

MICROORGANISMS
New Methods for Ecological Analysis of Microorganisms of Eutrophic Waters, (In Spanish),
W76-08252 5A

Biological Changes in the South St. Paul Sewage Treatment Plant Before and After Treatment with FeCl3 and Nalcolyte 675 Coagulating Agents,
W76-08290 5D

The Kinetics of Microbial Nitrification,
W76-08369 5D

Role of Vitamins in Bacterial-Plankton Relationships in Littoral Seawater and in Supralittoral Pools: II. Annual Evolution of Organisms Which Produce Vitamin Synthesis, (In French),
W76-08405 5C

The Effects of Lindane on the Morphology and the Growth of Some Unicellular Organisms, (In French),
W76-08676 5C

Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

Purifying-Demicrobising Waste-Water.
W76-08705 5D

MILL TAILINGS
Evaluation of Mill Tailings Disposal Practices and Potential Dam Stability Problems in Southwestern United States, General Report, Volume I,
W76-08143 5G

MILLET
Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

Thermal Scanner Measurements of Crop Temperatures to Estimate Evapotranspiration,
W76-08591 2D

MINE ACIDS
Preparation of Plans and Specifications for Pollution Abatement Activities in Cherry Creek Watershed, Maryland.
W76-08385 5G

Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

MINE DRAINAGE
The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

MINE WASTES
Evaluation of Mill Tailings Disposal Practices and Potential Dam Stability Problems in Southwestern United States, General Report, Volume I,
W76-08143 5G

The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

MINE WATER
Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

MINERAL FERTILIZERS
Change of the Content and State of Pigments in Leaves of Male and Female Hemp in Relation to Nutrition and Soil Moisture Content, (In Russian),
W76-08306 2I

MINERALOGY
The Effect of Mineral Environment on the Geohydrological Situation in Low Bog Sites, (In German),
W76-08184 2H

MINERALS
The Effect of Mineral Environment on the Geohydrological Situation in Low Bog Sites, (In German),
W76-08184 2H

MINNESOTA
A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

MIST
Moisturizing Apparatus for Use with Wind Machines,
W76-08399 3F

MIST IRRIGATION
Moisturizing Apparatus for Use with Wind Machines,
W76-08399 3F

MOBILE BAY (ALA)
Water Resources Planning for Rivers Draining into Mobile Bay, Part II: Non-Conservative Species Transport Models,
W76-08327 5B

Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

MODE OF ACTION
Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

MODEL STUDIES
Hydraulic Model Vortex Study-Grand Coulee Third Powerplant,
W76-08113 8B

Ground Water Flow No Longer a Mystery,
W76-08114 2F

Snowmelt-Runoff Model for Stream Flow Forecasts,
W76-08131 2E

A Model for Estimating Actual Evapotranspiration from Potential Evapotranspiration,
W76-08132 2D

Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

Arching of Fragmented Ice Covers,
W76-08149 2C

Development Trends in Methods used to Model Populations and Communities,
W76-08212 8I

Development Trends in Methods Used to Model Populations and Communities,
W76-08213 8I

Theoretical Bases of Modelling of Populations and Communities of Aquatic Animals,
W76-08214 8I

Abstract Models of Fish Populations,
W76-08215 8I

Models of Actual Fish Populations,
W76-08216 8I

Models of Populations of Aquatic Invertebrates,
W76-08217 8I

Abstract Models of Communities of Aquatic Animals,
W76-08218 8I

Models of Actual Communities,
W76-08219 8I

Derivation of a Model Rain for the Dimensioning of Sewer Systems (Entwicklung eines Berechnungsregens fuer die Bemessung von Kanalnetzen),
W76-08253 5D

A Theoretical Study of Factors Influencing the Microbial Population Dynamics of the Activated-Sludge Process-II. A Computer-Simulation Study to Compare Two Methods of Plant Operation,
W76-08277 5D

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

Momentum Transfer in Hydrodynamically Developing Laminar Flow in a Straight Channel,
W76-08318 8B

Water Resources Planning for Rivers Draining into Mobile Bay, Part II: Non-Conservative Species Transport Models,
W76-08327 5B

Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

Pollutant Transport in Natural Streams,
W76-08329 5B

Infiltration Analysis and Perturbation Methods 1. Absorption with Exponential Diffusivity,
W76-08334 2G

Flow Interference Effects at Fracture Intersections,
W76-08335 2F

A Parametric Wave Prediction Model,
W76-08337 2L

The Development of a Snow Routine for the HBV-2 Model,
W76-08338 2C

First-Year Water Yield Increase After Forest Cutting: An Alternative Model,
W76-08362 4C

Thermal-Hydraulic Model Study of Offshore Discharge System for Kahe Power Plant, Hawaii,
W76-08508 5B

The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

A Reconsideration of the Fiering Two-Station Model,
W76-08519 4A

Dynamic Response of Aquifer Systems to Localized Recharge,
W76-08520 2F

Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

Computations of Physical Transport and Regeneration of Phosphorus in Lake Erie, Fall 1970,
W76-08531 5B

Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

An Evaluation of a Resistance Form of the Energy Balance to Estimate Evapotranspiration,
W76-08587 2D

Resistance-Mass Transfer Method for Estimating Evapotranspiration: Comparison with Lysimetric Measurements in Irrigated Sorghum,
W76-08588 2D

Comparison of a Modified Brown-Rosenberg Resistance Model with other Evapotranspiration Estimation Methods: Tests in an Irrigated Sorghum Field,
W76-08589 2D

Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

Effects of Condenser Destruction of Algae on Dissolved Oxygen Levels in the James River,
W76-08638 5C

Laboratory Simulation of Power Plant Effects: Response of Some Estuarine Phytoplankters to Time Temperature Combinations,
W76-08646 5C

Calculated Drainage Water Compositions and Salt Burdens Resulting from Irrigation with River Waters in the Western United States,
W76-08671 5B

Phosphorus Movement in Soils: Soil-Orthophosphate Reaction Kinetics,
W76-08672 5B

Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

Continuous Dynamical Computations of Water Transports in Lake Erie for 1970,
W76-08724 2H

The Use of Likelihood Functions to Fit Conceptual Models with More than One Dependent Variable,
W76-08729 2G

Transient Water Quality Modeling in Streams,
W76-08730 5B

A Physical Model for the Rate of Deposition of Fine-Grained Sediments in the Deep Sea,
W76-08736 2J

One-Dimensional Temperature Predictions in Unsteady Flows,
W76-08738 5B

Numerical Prediction of Thermal-Regime of Rivers,
W76-08739 5B

Three-Dimensional Pollutant Modeling in Shear Flow,
W76-08740 5B

Computation of Tidal Flow in Well-Mixed Estuaries,
W76-08741 2L

Suppression of Waves in Slotted-Walled Channel,
W76-08742 8B

Implementation of Hydrologic Models at Goddard Space Flight Center.
W76-08745 2A

Fast Current Oil Control Study,
W76-08748 5G

MOISTURE

Moisturizing Apparatus for Use with Wind Machines,
W76-08399 3F

MOISTURE-ACCOUNTING FLOW

Implementation of Hydrologic Models at Goddard Space Flight Center.
W76-08745 2A

MOISTURE AVAILABILITY

Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

Effect of Solar Energy and Water on Plant Productivity (In Bulgarian),
W76-08576 2I

MOISTURE CONTENT

Calculating the Unsaturated Hydraulic Conductivity and Diffusivity,
W76-08142 2G

Change of the Content and State of Pigments in Leaves of Male and Female Hemp in Relation to Nutrition and Soil Moisture Content, (In Russian),
W76-08306 2I

Thermal Properties of Fine Textured Mollisols Under Varying Moisture Conditions,
W76-08364 2G

The State of Water in Plant Tissues at Negative Temperatures under Natural Conditions, (In Russian),
W76-08368 2I

MOLLISOLS

Thermal Properties of Fine Textured Mollisols Under Varying Moisture Conditions,
W76-08364 2G

MOLLUSCS

The Influence of Water Quality on Accumulation of Heavy Metals in Aquatic Organisms,
W76-08456 5C

MOLLUSKS

The Selection of Prey in 3 Malacophagous Fishes of Lake Chad, (In French),
W76-08178 2H

Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

MOLYBDENUM

The Impact of Molybdenum-Enriched Irrigation Water on Agricultural Soils Near Brighton, Colorado,
W76-08675 5B

MOMENTUM TRANSFER

Momentum Transfer in Hydrodynamically Developing Laminar Flow in a Straight Channel,
W76-08318 8B

MONOCASY RIVER (MD)

Implementation of Hydrologic Models at Goddard Space Flight Center.
W76-08745 2A

MONONGAHELA RIVER BASIN

Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

MONSOONS

Rainfall and Floods in India During 1974 Southwest Monsoon Period,
W76-08732 2B

MONUMENTAL DAM (WASH)

Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

MORPHOLOGY

The Effects of Lindane on the Morphology and the Growth of Some Unicellular Organisms, (In French),
W76-08676 5C

MORTALITY

Weight Loss, Mortality, Feeding, and Duration of Residence of Adult American Shad, Alosa Sapidissima in Fresh Water,
W76-08433 5C

Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

Survival Rate of Starving Carp (Cyprinus Carpio Linne), (In Russian),
W76-08552 5C

Zooplankton Survival in Cooling Water Systems of Four Thermal Power Plants on the California Coast-Interim Report. March 1971-January 1972,
W76-08630 5C

Vulnerability and Survival of Young Connecticut River Fish Entrained at a Nuclear Power Plant,
W76-08656 8I

MUD SUSPENSIONS

Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

MULTIPLE PURPOSE

Multiple Use Evaluations on Ponderosa Pine Forest Land,
W76-08109 4A

Pinyon-Juniper Control--Does it Pay,
W76-08110 4A

MULTIPLE USE DEMANDS

Present and Future Multiple use Demands on the Pinyon-Juniper Type,
W76-08430 4A

MUNICIPAL WASTES

An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

Cooperation Helps Erie,
W76-08481 5D

Study of the Effectiveness of Removing Heavy Metals in Biological Purification of Municipal Sewage, (In Russian),
W76-08580 5D

Municipal Industrial Waste Program Nets $8.9 Million in Two Years.
W76-08712 5D

MUNICIPAL WATER
Water Quality Criteria for Great Lakes Waters to be Used as Municipal and Industrial Water Supplies,
W76-08363 5D

MYCTOPHIDAE
Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

NARRAGANSETT BAY (RI)
Suspended Material Transport: Narragansett Bay Area, Rhode Island,
W76-08139 2L

Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
Water Pollution Control Act of 1972, Institutional Assessment, Planning.
W76-08192 5G

The Water Pollution Control Act of 1972, Institutional Assessment, The Permit Program.
W76-08193 5G

NATURAL RESOURCES
Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

NATURAL STREAMS
Reassessment of Mercury in Surface Water in the Adirondack Region, New York,
W76-08554 2K

NEANTHES SP.
The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

NEBRASKA
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

NETHERLANDS
The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

NETS
An Aquatic Technique for Collecting Small Adult Insects,
W76-08574 7B

NETWORK DESIGN
Design of Ground-Water Level Observation Network.
W76-08563 4B

NETWORKS
The Estimation of Local Rainfall by Sample Gauging,
W76-08348 2B

Eastern Lake Ontario Precipitation Network,
W76-08412 2B

Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

NEVADA
Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

NEW MEXICO
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

NEW YORK
An Optimization Model for Regional Water Quality Management,
W76-08104 5G

Land Use and Water Quality in New York Rivers,
W76-08133 5B

Shooting Models for Salinity and Coliform,
W76-08134 5B

A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

Reassessment of Mercury in Surface Water in the Adirondack Region, New York,
W76-08554 2K

NEW YORK BIGHT ECOSYSTEMS
A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

NEW YORK CITY (NY)
A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

NEWPORT RIVER ESTUARY (NC)
Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

NICKEL UPTAKE RATE
Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

NITRATE REDUCTION
Nitrate Reduction and Associated Microbial Populations in a Ponded Hanford Sandy Loam,
W76-08546 5G

NITRATES
Nitrate Reduction and Associated Microbial Populations in a Ponded Hanford Sandy Loam,
W76-08546 5G

Nitrate, Phosphate, and Potassium Movement into Drainage Lines under Three Soil Management Systems,
W76-08680 5B

NITRIFICATION
The Kinetics of Microbial Nitrification,
W76-08369 5D

NITROGEN
Evaluation of Methods for Preserving the Levels of Soluble Inorganic Phosphorus and Nitrogen in Unfiltered Water Samples,
W76-08157 5A

Nitrogen and Phosphorus Losses from Winter Disposal of Dairy Manure,
W76-08159 5C

Organic Carbon, Phosphorus and Nitrogen in the Waters of the Sea of Japan, (In Russian),
W76-08313 5A

Determination of Total Nitrogen in Natural Waters,
W76-08355 2K

Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

Effects of Forest Fertilization on Two Southeast Alaska Streams,
W76-08673 5B

A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

The Nitrogen Balance of Arctic Tundra: Pathways, Rates, and Environmental Implications,
W76-08678 5B

NITROGEN COMPOUNDS
Measurement Method for Dissolved Ammonia Nitrogen in Water (Yozon anmoniasei chisso nodo sokuteiho),
W76-08261 5A

Nitrogen Utilization During Spring Blooms of Marine Phytoplankton in Bedford Basin, Nova Scotia, Canada,
W76-08691 5C

NITROGEN CYCLE
Transient Water Quality Modeling in Streams,
W76-08730 5B

NON-STRUCTURAL ALTERNATIVES
Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

NONPARAMETRIC STATISTICAL ANALYSIS
Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

NONPOINT POLLUTION SOURCES
Land Use and Water Quality in New York Rivers,
W76-08133 5B

NORTH CAROLINA
A Seabed Drifter Study of Near-Bottom Circulation in North Carolina Shelf Waters,
W76-08350 2L

Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

NORTH PLATTE PROJECT (NEB)
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

NORTHERN ANCHOVY
Culture and Growth of Northern Anchovy, Engraulis Mordax Larvae,
W76-08432 2L

NORWAY
Evaluation of Glacier Mass Balance by Observing Variations in Transient Snowline Positions,
W76-08322 2C

NUMERICAL ANALYSIS
An Integrated Finite Difference Method for Analyzing Fluid Flow in Porous Media,
W76-08123 2F

Dense Effluent Dispersion in a Stream,
W76-08316 5B

Transient Aquifer Flows by Characteristics Method,
W76-08513 2F

NUTRIENT INPUT
The Significance and Variation of Atmospheric Nutrient Inputs in a Small Catchment System,
W76-08728 5A

NUTRIENTS
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

Eutrophication of Microponds,
W76-08354 5C

The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

The Significance and Variation of Atmospheric Nutrient Inputs in a Small Catchment System,
W76-08728 5A

OBSERVATION WELLS
Design of Ground-Water Level Observation Network.
W76-08563 4B

OCEAN CIRCULATION
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

Surface Circulation Pattern in the Gulf of St. Lawrence,
W76-08126 2L

OCEAN CURRENTS
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

Surface Circulation Pattern in the Gulf of St. Lawrence,
W76-08126 2L

Ekman Veering Observed Near the Ocean Bottom,
W76-08129 2L

OCEAN WAVES
The Theory and Applications of Ocean Wave Measuring Systems at and Below the Sea Surface, on the Land, from Aircraft, and from Spacecraft,
W76-08145 7B

A Parametric Wave Prediction Model,
W76-08337 2L

OCEANS
Ocean Thermal Energy Conversion.
W76-08366 8C

A Physical Model for the Rate of Deposition of Fine-Grained Sediments in the Deep Sea,
W76-08736 2J

ODOR
Libby, McNeill Solves an Odor Problem,
W76-08502 5D

OHIO
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

Note on the Distribution of Mercury in Fish Species in Three Ohio Lakes,
W76-08441 5C

OIL
Channel Erosion Surveys Along Taps Route, Alaska, 1974,
W76-08559 2J

OIL INDUSTRY
Sour Water Treatment Process.
W76-08496 5D

Determining Oil Content, in Water.
W76-08501 5A

OIL POLLUTION
Cleaning of Cargo Compartments,
W76-08198 5G

Updating the Navy Environmental Protection Data Base to Incorporate Oil Spill Clean-Up Performance,
W76-08320 5B

Floating Oil Barrier,
W76-08396 5G

Apparatus for Pumping Oil-Water Mixture from a Collection Vessel of a Floating Oil Collector into Settling Tanks,
W76-08403 5G

Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

Effect of Crude Oil on Populations of Bacteria and Algae in Artificial Ponds Subject to Winter Weather and Ice Formation,
W76-08453 5C

Fast Current Oil Control Study,
W76-08748 5G

OIL RECOVERY
Fast Current Oil Control Study,
W76-08748 5G

OIL RESERVOIRS
Amino Acids and Gases in Some Springs and an Oil Field in California,
W76-08568 4B

OIL SPILLS
Updating the Navy Environmental Protection Data Base to Incorporate Oil Spill Clean-Up Performance,
W76-08320 5B

Behaviour of Oil Under Canadian Climatic Conditions. Part 1. Oil on Water Under Ice-Forming Conditions,
W76-08365 5B

Fast Current Oil Control Study,
W76-08748 5G

OIL WASTES
Effect of Crude Oil on Populations of Bacteria and Algae in Artificial Ponds Subject to Winter Weather and Ice Formation,
W76-08453 5C

Treatment Method for Oil-Containing Liquid Waste (Ganyu haisui shoriho),
W76-08475 5D

Pollution Problem Solver,
W76-08483 5D

Removal of Oil Pollution.
W76-08484 5D

Treating Waste Liquors Containing Metal-Working Oil Emulsions.
W76-08492 5D

Slurry-Burning Process.
W76-08498 5D

Determining Oil Content, in Water.
W76-08501 5A

Studies Concerning Oil Removal from Mill Scale (Untersuchungen Zur Entoelung Von Walzzunder),
W76-08707 5D

OKLAHOMA
On-Site Runoff Depletion at Three Impoundments,
W76-08122 4A

Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

OLFACTORY HYPOTHESIS
Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

OLIGOTROPHY
Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

ON-SITE DATA COLLECTIONS
Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

ON-SITE INVESTIGATIONS
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

Entrainment of Planktonic Organisms into Cooling Water Systems of Three Mid-Atlantic Thermal Power Plants,
W76-08635 5C

OPEN CHANNEL FLOW
Suppression of Waves in Slotted-Walled Channel,
W76-08742 8B

OPEN SPACE
The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

OPERATING COSTS
Commercial Membrane Desalting Plants: Data and Analysis,
W76-08370 3A

OPERATION AND MAINTENANCE
Commercial Membrane Desalting Plants: Data and Analysis,
W76-08370 3A

OPERATIONS
Morrell Pioneers More Efficient Aeration,
W76-08286 5D

OPTIMIZATION
An Optimization Model for Regional Water Quality Management,
W76-08104 5G

Water Allocation.
W76-08154 6B

An Optimization Technique Adapted to USDAHL-74 Revised Model of Watershed Hydrology,
W76-08523 2A

OREGON
Ekman Veering Observed Near the Ocean Bottom,
W76-08129 2L

Some Three-Dimensional Characteristics of Low-Frequency Current Fluctuations Near the Oregon Coast,
W76-08336 2L

Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

Economic Evaluation of Proposed Water Conservation Practices on Established Irrigation Districts: A General Methodology and Application to Three Districts in Oregon,
W76-08431 3F

ORGANIC ACIDS
Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

ORGANIC CARBON
Organic Carbon, Phosphorus and Nitrogen in the Waters of the Sea of Japan, (In Russian),
W76-08313 5A

Fine-Dispersed Fraction of Suspended Organic Matter in the East Pacific Waters, (In Russian),
W76-08314 5C

Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

ORGANIC CHEMICALS INDUSTRY
Capabilities and Costs of Technology for the Organic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08188 5G

ORGANIC COMPOUNDS
Determination of Biological Degradability of Organic Substances,
W76-08351 5B

Purifying-Demicrobising Waste-Water.
W76-08705 5D

ORGANIC MATTER
Fine-Dispersed Fraction of Suspended Organic Matter in the East Pacific Waters, (In Russian),
W76-08314 5C

The Role of Organic Detritus in the Formation of Distinctive Sandy Tidal Flat Sedimentary Structures, Tay Estuary, Scotland,
W76-08524 2L

The Responses of Soils and Soil Microorganisms to Silver Iodide Weather Modification Agents,
W76-08670 2G

ORGANIC NITROGEN
Transient Water Quality Modeling in Streams,
W76-08730 5B

ORGANIC WASTES
Method and Apparatus for the Destructive Decomposition of Organic Wastes Without Air Pollution and With Recovery of Chemical Byproducts,
W76-08459 5D

Process for Treating Water-Soluble Organic Wastes,
W76-08482 5D

OSCILLATIONS
Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case,
W76-08124 2F

OSCILLATORY CURRENT FLOW
Water Volume Transport and Oscillatory Current Flow Through the Straits of Mackinac,
W76-08128 2H

OSCILLATORY CURRENTS
Measurements of Current Flow During Summer in Lake Huron,
W76-08413 2H

OSTROCODS
Research Studies on the Fauna of the Greek Subterranean Waters, (In French),
W76-08296 2L

OUTCROPS
The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

OXIDATION
Some Aspects of Tannery Effluent Control,
W76-08175 5D

Catalytic Filtering-Incinerating Process and Device for Waste Water,
W76-08400 5D

Pressurized Oxidation of Pulp Spent Liquor (Parupu haieki no kaatsu snaka),
W76-08696 5D

OXIDATION DITCH
Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

Morrell Pioneers More Efficient Aeration,
W76-08286 5D

OXIDATION LAGOONS
Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

Morrell Pioneers More Efficient Aeration,
W76-08286 5D

OXYGEN
Process for Treating Water-Soluble Organic Wastes,
W76-08482 5D

Oxygen, and Other Innovations, Help Lick Tough Waste Problem,
W76-08715 5D

OXYGEN BALANCE
Introduction to Hydrobiology. Hydrobiology: A Compendium for Engineers and Natural Scientists, (In German),
W76-08315 5C

OXYGEN DEMAND
Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

Transient Water Quality Modeling in Streams,
W76-08730 5B

OXYGEN SAG
Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

Distributions of BOD and Do In Rivers and Lakes,
W76-08743 5B

OXYGENATION
O2 Injection Doubles/Triples Biological Waste Treatment Activity.
W76-08167 5D

PACIFIC OCEAN
Ekman Veering Observed Near the Ocean Bottom,
W76-08129 2L

Some Three-Dimensional Characteristics of Low-Frequency Current Fluctuations Near the Oregon Coast,
W76-08336 2L

The Plutonium Content of Pacific Ocean Waters,
W76-08601 5C

PARTICLE SIZE
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

PARTICLE VAPORIZER
Particle Vaporizer,
W76-08148 3B

PASTURES
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

PATENTS
Irrigation Signalling Device,
W76-08196 3F

Adjustable Soaker Hose Support Assembly,
W76-08197 3F

Cleaning of Cargo Compartments,
W76-08198 5G

Solid Mineral and Regenerant Recovery for Ion-Exchange Resins,
W76-08199 3A

Zero Energy Input Flocculator,
W76-08200 5F

Sterilization of Holding Tanks and Toilet Bowls by Quaternary Compounds,
W76-08201 5D

Apparatus for Continuous Dewatering of Aqueous Suspensions,
W76-08202 5D

Liquid Conditioning and Settling Tanks,
W76-08203 5D

Method for Locating and Evaluating Geothermal Sources of Energy by Sensing Electrostatic Voltage Gradients,
W76-08204 4B

Fan Disturbing Sand at the Bottom of a Body of Water so That it May be Pumped up Efficiently,
W76-08205 8C

Purification of Effluent,
W76-08206 5D

Decolorizing Method for Waste Kraft Paper Mill Effluents,
W76-08207 5D

Process for the Environmentally Favorable Destruction of Solid and/or Liquid Cyanide Waste,
W76-08208 5D

Coanda Effect Oil-Water Separator,
W76-08209 5G

Modular Water Filter,
W76-08210 5F

Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

Combination Sewage Treatment and Cooling System,
W76-08242 5D

Measurement Method for Dissolved Ammonia Nitrogen in Water (Yozon anmoniasei chisso nodo sokuteiho),
W76-08261 5A

Apparatus for Flushing Sewers,
W76-08262 5D

Demand Bactericide for Disinfecting Water and Process of Preparation,
W76-08391 5D

Water Filter Assembly,
W76-08392 8C

Ground Treatment Apparatus,
W76-08393 3F

Method for Treating Sewage Water,
W76-08394 5D

Process for Purification of Industrial Waste Waters from Perchlorates and Chlorates,
W76-08395 5D

Floating Oil Barrier,
W76-08396 5G

Rain Gauge,
W76-08397 2B

Irrigation System (Lifting Dogs),
W76-08398 3F

Moisturizing Apparatus for Use with Wind Machines,
W76-08399 3F

Catalytic Filtering-Incinerating Process and Device for Waste Water,
W76-08400 5D

Removing Heavy Metal Ions from Water,
W76-08401 5D

Removal of Heavy Metal Ions from Wastewater,
W76-08402 5D

Apparatus for Pumping Oil-Water Mixture from a Collection Vessel of a Floating Oil Collector into Settling Tanks,
W76-08403 5G

Method and Apparatus for Drying Moisture-Containing Solids, Particularly Domestic Refuse and Sludge Cakes,
W76-08404 5D

Underground Irrigation System,
W76-08406 3F

Self Propelled Sprinkling Irrigation Apparatus,
W76-08407 3F

Process and Apparatus for Recovering Clean Water From Aqueous Wastes,
W76-08408 5D

Process of Preparing Sewage Sludge for Dewatering,
W76-08409 5D

Method and Apparatus for the Destructive Decomposition of Organic Wastes Without Air Pollution and With Recovery of Chemical Byproducts,
W76-08459 5D

Paper Pulp Effluent Purification.
W76-08462 5D

Recovery and Separation of Chemicals Produced During Kraft Pulping Operations,
W76-08467 5D

Process for the Electrolytic Reclamation of Spent Etching Fluids,
W76-08471 5D

Industrial Effluent Treatment,
W76-08473 5D

Treatment Method for Oil-Containing Liquid Waste (Ganyu haisui shoriho),
W76-08475 5D

Elimination Method for Mercury Residue in Water (Suichu yozon suigin no jokyoho),
W76-08476 5D

Plating Waste Recovery Unit,
W76-08478 5D

Process for Treating Water-Soluble Organic Wastes,
W76-08482 5D

Removal of Oil Pollution.
W76-08484 5D

Treatment of Effluent.
W76-08488 5D

Heavy Metal Salts Recovery.
W76-08490 5D

Treating Waste Liquors Containing Metal-Working Oil Emulsions.
W76-08492 5D

Metallic Recovery System,
W76-08493 5D

Effluent Water Treatment.
W76-08494 5D

Settling Tank,
W76-08495 5D

Removing Fine Plastic Particles From Waste Water.
W76-08497 5D

Determining Oil Content, in Water.
W76-08501 5A

Animal Food.
W76-08503 5D

Purification of Waste Water.
W76-08505 5D

Sulphuric Acid Containing Rinses, Purification,
W76-08506 5D

Paper Making Waste-Water Purification.
W76-08695 5D

Chemical Clarification of Waste Water.
W76-08702 5D

Purifying-Demicrobising Waste-Water.
W76-08705 5D

Clearing of Titanium- and Aluminium-Containing Effluent Waters.
W76-08708 5D

Electrolytic Purification of Trade Effluents Containing Toxic Materials,
W76-08709 5D

Cleaning of Industrial Effluent,
W76-08719 5D

PATH OF POLLUTANTS
Dense Effluent Dispersion in a Stream,
W76-08316 5B

Pollutant Transport in Natural Streams,
W76-08329 5B

Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

Note on the Distribution of Mercury in Fish Species in Three Ohio Lakes,
W76-08441 5C

PATH OF POLLUTANTS

Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

Computations of Physical Transport and Regeneration of Phosphorus in Lake Erie, Fall 1970,
W76-08531 5B

Distribution and Movement of Zinc and Other Heavy Metals in South San Francisco Bay, California,
W76-08561 5B

Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

The Nitrogen Balance of Arctic Tundra: Pathways, Rates, and Environmental Implications,
W76-08678 5B

PATUXENT RIVER BASIN (MD)

Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

PATUXENT RIVER (MD)

Implementation of Hydrologic Models at Goddard Space Flight Center.
W76-08745 2A

PAUNCH HANDLING AND PROCESSING

Paunch Handling and Processing Techniques,
W76-08173 3E

PAVING

Investigation of Roadway Drainage as Related to the Performance of Flexible Pavements,
W76-08534 8B

PEAK DISCHARGE

Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

Interstation Correlation of Peak-Flow Estimates,
W76-08555 4A

PEANUT SKINS

Removing Heavy Metal Ions from Water,
W76-08401 5D

PENNSYLVANIA

Selected Hydrologic Data, Chester County, Pennsylvania,
W76-08557 7C

PERCHLORATES

Process for Purification of Industrial Waste Waters from Perchlorates and Chlorates,
W76-08395 5D

PERIPHYTON

Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

PERMEABILITY

Channel Flow Over Permeable Beds of Graded Spheres,
W76-08511 8B

Infiltration into Increasingly Permeable Soils,
W76-08516 2G

PERMITS

The Water Pollution Control Act of 1972, Institutional Assessment, The Permit Program.
W76-08193 5G

Innovative Technologies for Water Pollution (Abatement).
W76-08220 5G

The Water Pollution Control Act of 1972 Institutional Assessment, Attitudes of Participants.
W76-08221 5G

PEROXYGEN

A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

PERSIAN WALNUT

Dependence of Stomatal Number and Size in Juglans Regia L. on Ecological Conditions, (In Bulgarian),
W76-08668 2I

PERVIOUS SOILS

Channel Flow Over Permeable Beds of Graded Spheres,
W76-08511 8B

PESTICIDE RESIDUES

Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

Considerations of Testing the Accumulation of Pesticides by Means of Artificial Food Chains,
W76-08361 5A

Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

Chlorinated Hydrocarbon Pesticides and Mercury in Coastal Biota, Puerto Rico and the U.S. Virgin Islands--1972-74,
W76-08683 5B

PESTICIDES

A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

The Effects of Lindane on the Morphology and the Growth of Some Unicellular Organisms, (In French),
W76-08676 5C

PETROLEUM REFINING INDUSTRY

Water Pollution Abatement Technology: Costs and Capabilities Petroleum Refining Industry, Part 1, Chapters -V.
W76-08190 5G

PHOSPHATES

An Ignition Method for Determination of Total Phosphorus in Lake Sediments,
W76-08346 5A

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Nitrate, Phosphate, and Potassium Movement into Drainage Lines under Three Soil Management Systems,
W76-08680 5B

PHOSPHORUS

Biological Problems of a Manmade Small Lake, (In German),
W76-08107 5C

Evaluation of Methods for Preserving the Levels of Soluble Inorganic Phosphorus and Nitrogen in Unfiltered Water Samples,
W76-08157 5A

Nitrogen and Phosphorus Losses from Winter Disposal of Dairy Manure,
W76-08159 5C

Organic Carbon, Phosphorus and Nitrogen in the Waters of the Sea of Japan, (In Russian),
W76-08313 5A

The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Computations of Physical Transport and Regeneration of Phosphorus in Lake Erie, Fall 1970,
W76-08531 5B

Phosphorus Movement in Soils: Soil-Orthophosphate Reaction Kinetics,
W76-08672 5B

A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

PHOSPHORUS COMPOUNDS

An Ignition Method for Determination of Total Phosphorus in Lake Sediments,
W76-08346 5A

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

PHOSPHORUS REGENERATION
Computations of Physical Transport and Regeneration of Phosphorus in Lake Erie, Fall 1970,
W76-08531 5B

PHOSPHORUS REMOVAL
Lake Michigan Gets Help,
W76-08246 5D

PHOSPHORUS SORPTION
Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

PHOTOGRAMMETRY
Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

PHOTOGRAPHIC PROCESSING WASTES
Treatment of Photographic Ferrocyanide-Type Bleach Solutions for Reuse and Disposal,
W76-08472 5D

PHOTOMETRY
Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

PHYTOCENOSIS
Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

PHYTOPATHOGENIC BACTERIA
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

PHYTOPLANKTON
Biological Problems of a Manmade Small Lake, (In German),
W76-08107 5C

An Ecologic Survey of Lake Endine, (In Italian),
W76-08244 5C

Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

Phytoplankton in Northern Donetsk Ponds for Additional Treatment, (In Ukranian),
W76-08577 5C

Phytoplankton Entrainment Studies at the Indian River Estuary, Delaware,
W76-08636 5C

Biochemical Studies of Entrained Phytoplankton at the Morgantown Maryland Power Plant,
W76-08642 5C

Morgantown Entrainment. Part IV. Phytoplankton Taxonomic Studies,
W76-08643 5C

Response of Phytoplankton to Thermal Stress,
W76-08644 5C

Laboratory Simulation of Power Plant Effects: Response of Some Estuarine Phytoplankters to Time Temperature Combinations,
W76-08646 5C

Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

Nitrogen Utilization During Spring Blooms of Marine Phytoplankton in Bedford Basin, Nova Scotia, Canada,
W76-08691 5C

PHYTOTOXICITY
Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

PIGMENT CONTENT (LEAVES)
Soil Moisture Regime and Pigment Content in Leaves of Cereals, (In Belorussian),
W76-08304 3F

PILOT-SCALE TESTS
Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

PINK SHRIMP
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

PINYON JUNIPER TYPE
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

Present and Future Multiple use Demands on the Pinyon-Juniper Type,
W76-08430 4A

PIPE SIZE
Graphic Determination of Sub-Main Pipe Size for Solid-Set Sprinkler Irrigation on Steep, Non-Uniform Slopes,
W76-08682 3F

PIPELINE STREAM CROSSINGS (ALASKA)
Channel Erosion Surveys Along Taps Route, Alaska, 1974,
W76-08559 2J

PIPELINES
Safeguard Fluid-Handling Equipment with Pipeline Basket Strainers,
W76-08235 8G

Channel Erosion Surveys Along Taps Route, Alaska, 1974,
W76-08559 2J

PIT RECHARGE
Artificial-Recharge Experiments in the Alluvial Aquifer South of Fountain, El Paso County, Colorado,
W76-08571 4B

PLANKTON
Role of Vitamins in Bacterial-Plankton Relationships in Littoral Seawater and in Supralittoral Pools: II. Annual Evolution of Organisms Which Produce Vitamin Synthesis, (In French),
W76-08405 5C

Entrainment of Planktonic Organisms into Cooling Water Systems of Three Mid-Atlantic Thermal Power Plants,
W76-08635 5C

Abundance and Biomass of Bacterioplankton of 'Tastaka' Ponds, (In Russian),
W76-08664 5C

PLANKTON TOWER
The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

PLANNING
Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality,
W76-08152 6B

Water Supply.
W76-08153 4A

Water Allocation.
W76-08154 6B

Water Quality.
W76-08155 5G

Water Pollution Control Act of 1972, Institutional Assessment, Planning.
W76-08192 5G

Development of Storm Drainage Cost Functions,
W76-08227 3D

The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

Planning Irrigation and Drainage Systems Using Retention and Extraction Limits,
W76-08553 3F

Desalting Handbook for Planners.
W76-08584 3A

PLANT GROWTH
Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

Effect of Solar Energy and Water on Plant Productivity (In Bulgarian),
W76-08576 2I

Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

PLANT TISSUES
The State of Water in Plant Tissues at Negative Temperatures under Natural Conditions, (In Russian),
W76-08368 2I

Study of Self-Diffusion of Water and its Activation Energy in Cells of Different Plant Tissues, (In Russian),
W76-08429 2I

Relation Between Plant Transpiration and Metabolism, (In Russian),
W76-08583 2D

PLASMA ELECTROLYTES
Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

PLASTIC DEFORMATION
Schriftenreih, (Otto-Graf-Institut), (In German).
W76-08425 8D

PLASTICS
Removing Fine Plastic Particles From Waste Water.
W76-08497 5D

Industrial Waste Treatment System Reduces Pollution,
W76-08711 5D

PLUTONIUM
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

Plutonium in the Aquatic Environment, Its Behaviour, Distribution and Significance,
W76-08599 5C

Plutonium in Atlantic Coastal Estuaries in the Southeastern United States of America,
W76-08600 5C

The Plutonium Content of Pacific Ocean Waters,
W76-08601 5C

Interaction of Plutonium with Complexing Substances in Soils and Natural Waters,
W76-08605 5B

Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

Plutonium Radionuclides in the Groundwaters at Enewetak Atoll,
W76-08607 5B

Double-Tracer Studies to Optimize Conditions for the Radiochemical Separation of Plutonium from Large Seawater Samples,
W76-08610 5A

Isotopic Analysis of Plutonium in Environmental Samples by Isotope Dilution Mass Spectrometry,
W76-08612 5A

Procedure for Plutonium Analysis of Large (100 g) Soil and Sediment Samples,
W76-08613 5A

Radiochemical Determination of Plutonium in Marine Samples by Ion Exchange and Solvent Extraction,
W76-08614 5A

Determination of Plutonium in the Marine Environment,
W76-08615 5A

Results of Plutonium Intercalibration in Seawater and Seaweed Samples,
W76-08616 5A

POLAND
The Effect of Controlled Eutrophication on Solar Radiation Penetrating into Ponds, (In Polish),
W76-08305 5C

POLELECTROLYTES
Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

POLLUTANT IDENTIFICATION
Evaluation of Methods for Preserving the Levels of Soluble Inorganic Phosphorus and Nitrogen in Unfiltered Water Samples,
W76-08157 5A

New Methods for Ecological Analysis of Microorganisms of Eutrophic Waters, (In Spanish),
W76-08252 5A

Detection of Salts of 2,4-D in Aqueous Solution by Laser Raman Spectroscopy,
W76-08254 5A

An Improved Method for Determination of the Chemical Oxygen Demand with Potassium Dichromate (Cod-Method) (Eine Verbesserte Methode zur Bestimmung des Chemischen Sauerstoffbedarfs mit Kaliumdichromat) (Cod-Methode),
W76-08256 5A

Measurement Method for Dissolved Ammonia Nitrogen in Water (Yozon anmoniasei chisso nodo sokuteiho),
W76-08261 5A

Absorptiometric Determination of Iron with T.P.T.Z.,
W76-08273 5A

Simultaneous Determination of Cu2+, Pb2+, Cd2+, and Zn2+ in Fresh Town-Water by Anodic Stripping Polargraphy, (In Japanese),
W76-08275 5A

A Continuous Method of Monitoring Water Quality by Chlorine Consumption Under Ultraviolet Radiation. I. Design and Performance Test of Continuous Chlorine Consumption Meter and Application to Raw Waters of A Water Purification Plant, (In Japanese),
W76-08276 5A

A Study on Marine Trace Elements and CSK Standards, (In Japanese),
W76-08311 2L

An Ignition Method for Determination of Total Phosphorus in Lake Sediments,
W76-08346 5A

Determination of Total Nitrogen in Natural Waters,
W76-08355 2K

Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

Considerations of Testing the Accumulation of Pesticides by Means of Artificial Food Chains,
W76-08361 5A

Determination of Traces of Carbon in Solid and Liquid Wastes of Chemical Plants by Means of Thermal Conductivity Measurements (Bestimmung Von Spuren Kohlenstoff in Festen Und Fluessigen Abfallstoffen Der Chemischen Industrie Mit Hilfe Der Waermeleitfaehigkeitsmessung),
W76-08499 5A

Determining Oil Content, in Water.
W76-08501 5A

Environmental Monitoring from Spacecraft Data,
W76-08532 5A

Reassessment of Mercury in Surface Water in the Adirondack Region, New York,
W76-08554 2K

Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

POLLUTANTS
A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

POLLUTION ABATEMENT
An Optimization Model for Regional Water Quality Management,
W76-08104 5G

What Does a 'Clean' Environment Cost,
W76-08150 5G

Control of Acid Mine Drainage.
W76-08156 5G

Water Pollution Abatement Technology, Capabilities and Costs, Textile Industry.
W76-08186 5G

Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

Capabilities and Costs of Technology for the Organic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08188 5G

Capabilities and Costs of Technology for the Inorganic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08189 5G

Water Pollution Abatement Technology: Costs and Capabilities Petroleum Refining Industry, Part 1, Chapters -V.
W76-08190 5G

Water Pollution Abatement Technology: Costs and Capabilities, Petroleum Refining Industry, Part 2, Chapters VI - IX.
W76-08191 5G

Innovative Technologies for Water Pollution (Abatement).
W76-08220 5G

Optimal Pollution Control and Trade in Collective Goods,
W76-08367 5G

Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

Floating Oil Barrier,
W76-08396 5G

POLLUTION TAXES (CHARGES)
Optimal Pollution Control and Trade in Collective Goods,
W76-08367 5G

POLYCHLORINATED BIPHENYLS
Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

Baseline Concentrations of Polychlorinated Biphenyls and DDT in Lake Michigan Fish, 1971,
W76-08685 5A

POLYMER MEMBRANES
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

POLYVINYL CHLORIDE
Removing Fine Plastic Particles From Waste Water.
W76-08497 5D

PONDEROSA PINE TREES
Multiple Use Evaluations on Ponderosa Pine Forest Land,
W76-08109 4A

Pinyon-Juniper Control--Does it Pay,
W76-08110 4A

PONDS
The Effect of Controlled Eutrophication on Solar Radiation Penetrating into Ponds, (In Polish),
W76-08305 5C

Phytoplankton in Northern Donetsk Ponds for Additional Treatment, (In Ukranian),
W76-08577 5C

POPULATIONS
Theoretical Bases of Modelling of Populations and Communities of Aquatic Animals,
W76-08214 8I

PORE PRESSURE
Artificially Simulating the Geological History of Clay,
W76-08421 8D

PORE SIZE DISTRIBUTION (SOILS)
Pore Size Distribution of Compacted Soils After Critical Region Drying,
W76-08416 2G

POROSITY
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

Pore Size Distribution of Compacted Soils After Critical Region Drying,
W76-08416 2G

POROUS MEDIA
An Integrated Finite Difference Method for Analyzing Fluid Flow in Porous Media,
W76-08123 2F

Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

POTABLE WATER
Modular Water Filter,
W76-08210 5F

The Water Supply System of a Large Urban Agglomeration in Switzerland (Die Wasserversorgung Einer Schweizerischen Gross-Agglomeration),
W76-08233 5F

Water Quality Criteria for Great Lakes Waters to be Used as Municipal and Industrial Water Supplies,
W76-08363 5D

Drinking Water Purification in Industrially Manufactured Compact Installations of the Type 'Struya', (In English),
W76-08579 5F

POTASSIUM
Nitrate, Phosphate, and Potassium Movement into Drainage Lines under Three Soil Management Systems,
W76-08680 5B

POTASSIUM ARABONATE
Decontamination of Wastewaters at the Stage of Potassium Arabonate in the Production of Vitamin B2, (In Russian),
W76-08578 5D

POTASSIUM COMPOUNDS
Decontamination of Wastewaters at the Stage of Potassium Arabonate in the Production of Vitamin B2, (In Russian),
W76-08578 5D

POTENTIAL EVAPOTRANSPIRATION
A Model for Estimating Actual Evapotranspiration from Potential Evapotranspiration,
W76-08132 2D

POTOMAC RIVER
The Effects of Entrainment on Phytoplankton at the Morgantown Steam Electric Station, Potomac River Estuary, September 5-8, 1972,
W76-08641 5C

POULTRY
Hygienic Substantiation of the Possibility of Wastewater Treatment of Poultry Processing Plants on Underground Filter Beds, (In Russian),
W76-08581 5D

POULTRY PROCESSING INDUSTRY
Duck-Processing Waste,
W76-08168 3E

Protein and Fat Recovery from Effluents,
W76-08172 5D

The Influence of Soils and Plant Cover on the Retention and Utilization of Suspended and Dissolved Materials in the Waste Water of a Poultry Processing Plant,
W76-08287 5D

Wastes from the Poultry Processing Industry,
W76-08292 3E

Recycling of Water in Poultry Processing Plants,
W76-08298 3E

POULTRY PROCESSING WASTES
Spray Irrigation of Polutry Processing Wastewater,
W76-08165 5D

Waste Treatment and Control at Live Oak Poultry Processing Plant,
W76-08185 3E

Use, Continued Use, and Reuse of Both Process and Waste Waters in Poultry Processing Operations,
W76-08299 3E

Economics of In-Plant Waste Management in Food Processing,
W76-08300 3E

Water and Waste Management in Poultry Processing,
W76-08428 3E

PRE-IMPOUNDMENT
Water Quality in the Mad River Basin, Humboldt and Trinity Counties, California,
W76-08562 5A

PRECIPITATION (ATMOSPHERIC)
How Much Precipitation Goes to Infiltration During a Storm Period,
W76-08339 2A

Eastern Lake Ontario Precipitation Network,
W76-08412 2B

A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

The Significance and Variation of Atmospheric Nutrient Inputs in a Small Catchment System,
W76-08728 5A

PRECIPITATION GAGES
A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

PRECIPITATION INTENSITY
Influence of the Local Precipitation Quantity on the Loading of Water Bodies with Mixed Water (Der Einfluss der Oertlichen Neiderschlagshoehe auf die Belastung der Gewaesser Mit Mischwasser),
W76-08258 5B

Eastern Lake Ontario Precipitation Network,
W76-08412 2B

PREDATION
The Selection of Prey in 3 Malacophagous Fishes of Lake Chad, (In French),
W76-08178 2H

PRESERVATION
Evaluation of Methods for Preserving the Levels of Soluble Inorganic Phosphorus and Nitrogen in Unfiltered Water Samples,
W76-08157 5A

PRESSURE HEAD
Calculating the Unsaturated Hydraulic Conductivity and Diffusivity,
W76-08142 2G

PRESSURE MEASURING INSTRUMENTS
Earth Pressure Observations on a Retaining Wall in Expansive Clay, Gougher Street Mail Exchange, Adelaide,
W76-08424 8D

PRESSURIZED OXIDATION METHOD
Pressurized Oxidation of Pulp Spent Liquor (Parupu haieki no kaatsu snaka),
W76-08696 5D

PRETREATMENT (WATER)
Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

PRIMARY PRODUCTIVITY
Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

PROBABILITY
Reassessment of the Cross-Florida Barge Canal: A Probability Approach,
W76-08228 4A

PROBABLE MAXIMUM PRECIPITATION
Extreme Rainfall Studies of the Brahmani, The Burhabalang, The Rushikulya and the Subarnarekha River Catchments,
W76-08733 2B

PROCESS CHANGE
A Very Rapid Liming and Tanning Process Without Effluent,
W76-08181 3E

No-Effluent Tannery Processes,
W76-08182 3E

Recent Investigations into the Disposal of Tannery Waste Water,
W76-08183 5D

PRODUCTIVITY
Development Trends in Methods used to Model Populations and Communities,
W76-08212 8I

Phytoplankton Entrainment Studies at the Indian River Estuary, Delaware,
W76-08636 5C

Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

PROJECT PLANNING
Design of an Experiment to Suppress Hail in Illinois,
W76-08330 3B

Design of Ground-Water Level Observation Network.
W76-08563 4B

PROJECTS
Annual Report, Water Resources Research Activities under Public Law 88-379, Fiscal Year 1975.
W76-08163 9D

PSYCHOLOGICAL ASPECTS
Identification, Measurement, and Incorporation of Environmental Quality Objectives in Natural Resource Development,
W76-08101 6B

PUBLIC HEALTH
Environmental and Public Health Consequences of the Controlled Disposal of Transuranic Elements to the Marine Environment,
W76-08604 5C

PUERTO RICO
Chlorinated Hydrocarbon Pesticides and Mercury in Coastal Biota, Puerto Rico and the U.S. Virgin Islands--1972-74,
W76-08683 5B

PULP AND PAPER INDUSTRY
Biological Processes for Effluent and Waste Treatment Exemplified by the Paper Industry (Biologische Verfahren Zur Abwasser- Und Abfallaufbereitung am Beispiel der Paper-Industrie),
W76-08699 5D

The Effluent Treatment System and Utilization of Recycled Water in the Iyomishima Mill (Daio seishi Mishima kojo ni okeru sogo haisui shori to haisui no sairiyo),
W76-08700 5D

PULP WASTES
Decolorizing Method for Waste Kraft Paper Mill Effluents,
W76-08207 5D

The Control of Chloride Ions in the MgO Recovery System,
W76-08457 5D

Method and Apparatus for the Destructive Decomposition of Organic Wastes Without Air Pollution and With Recovery of Chemical Byproducts,
W76-08459 5D

Foam Detoxification of Bleached Kraft Effluent,
W76-08460 5D

Detoxification of Bleached Kraft Mill Effluents,
W76-08461 5D

Paper Pulp Effluent Purification.
W76-08462 5D

Recovery and Separation of Chemicals Produced During Kraft Pulping Operations,
W76-08467 5D

Treatment of Effluent.
W76-08488 5D

Fiber Recovery Increases Water Re-Use, Reduces Treatment Cost,
W76-08489 5D

Rapson Idea Set for Mill Trials.
W76-08500 5D

Paper Making Waste-Water Purification.
W76-08695 5D

Pressurized Oxidation of Pulp Spent Liquor (Parupu haieki no kaatsu snaka),
W76-08696 5D

The Long Hard Road to the Effluent-Free Pulp Mill,
W76-08698 5D

Biological Processes for Effluent and Waste Treatment Exemplified by the Paper Industry (Biologische Verfahren Zur Abwasser- Und Abfallaufbereitung am Beispiel der Paper-Industrie),
W76-08699 5D

The Effluent Treatment System and Utilization of Recycled Water in the Iyomishima Mill (Daio seishi Mishima kojo ni okeru sogo haisui shori to haisui no sairiyo),
W76-08700 5D

Recycling--Examples for Its Possibilities and Limits (Recycling--Beispiele fuer Moeglichkeiten und Grenzen),
W76-08701 5D

Purifying-Demicrobising Waste-Water.
W76-08705 5D

PUMP TESTING
Field Evaluation Testing of Reverse Osmosis High Pressure Pumps and Energy Recovery Turbines.
W76-08372 3A

PUMPING
Estimation by Digital Computer of the Drawdown Caused by Groundwater Withdrawal,
W76-08140 4B

Improved Image-Well Technique for Aquifer Analysis,
W76-08517 4B

PUMPS
Pumps Free City from Lake Erie Flooding.
W76-08250 8C

'We've Found a Real Time-Saver',
W76-08251 8C

Apparatus for Pumping Oil-Water Mixture from a Collection Vessel of a Floating Oil Collector into Settling Tanks,
W76-08403 5G

PURGATOIRE RIVER (CO)
Flood Plain Information: Purgatoire River and Tributaries, Vicinity of Trinidad, Colorado.
W76-08381 4A

PYRAMID LAKE (NEV)
Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

PYROLYSIS
Method and Apparatus for the Destructive Decomposition of Organic Wastes Without Air Pollution and With Recovery of Chemical Byproducts,
W76-08459 5D

Metallic Recovery System,
W76-08493 5D

QUACKGRASS SOD
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

QUALITY CONTROL
Quality Control in Radiochemical Analysis,
W76-08609 5A

QUATERNARY COMPOUNDS
Sterilization of Holding Tanks and Toilet Bowls by Quaternary Compounds,
W76-08201 5D

RADAR
The Study of Fresh-Water Lake Ice Using Multiplexed Imaging Radar,
W76-08138 2C

A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

RADIAL FLOW
Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

RADIATION
Comparison of a Modified Brown-Rosenberg Resistance Model with other Evapotranspira-

tion Estimation Methods: Tests in an Irrigated Sorghum Field,
W76-08589 2D

Canopy Temperature Measurement of Sorghum and Millet with Leaf Thermocouple and Infrared Thermometer Techniques,
W76-08590 2D

RADIOACTIVE DECAY
Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

RADIOACTIVE WASTE DISPOSAL
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

RADIOACTIVE WASTES
Evaluation of Mineralization Processes for SRP Wastes,
W76-08595 5G

RADIOACTIVITY
Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

RADIOCHEMICAL ANALYSIS
Reference Methods for Marine Radioactivity Studies II.
W76-08608 5A

Quality Control in Radiochemical Analysis,
W76-08609 5A

Double-Tracer Studies to Optimize Conditions for the Radiochemical Separation of Plutonium from Large Seawater Samples,
W76-08610 5A

A Procedure for Analysis of Amercium in Marine Environmental Samples,
W76-08611 5A

Isotopic Analysis of Plutonium in Environmental Samples by Isotope Dilution Mass Spectrometry,
W76-08612 5A

Procedure for Plutonium Analysis of Large (100 g) Soil and Sediment Samples,
W76-08613 5A

Radiochemical Determination of Plutonium in Marine Samples by Ion Exchange and Solvent Extraction,
W76-08614 5A

Determination of Plutonium in the Marine Environment,
W76-08615 5A

Results of Plutonium Intercalibration in Seawater and Seaweed Samples,
W76-08616 5A

Methods of Ruthenium 106 Analysis in Marine Environmental Samples, - A Review,
W76-08617 5A

Determination of Radionuclides of Ce, Co, Fe, Ru, Zn and Zr in Seawater by Preconcentration of Colloidal Manganese Dioxide, Application to the Determination of Low Level Ruthenium 106,
W76-08618 5A

A Review of Methods for the Determination of Radioactive and Stable Zirconium in the Marine Environment,
W76-08620 5A

A Review of Methods for the Determination of Radioactive and Stable Silver in the Marine Environment,
W76-08621 5A

A Review of Methods for the Determination of Iodine-131 in the Marine Environment,
W76-08622 5A

A Rapid Method for the Determination of Radioiodine in Suspended Matter and Seawater,
W76-08623 5A

A Method for the Rapid Enrichment and Determination of Silver-110m and Iodine-131 from Seawater,
W76-08624 5A

A Study of the Stability of Some Radionuclides in Seawater,
W76-08625 5A

Intercalibration of Methods for Radionuclide Measurements on a Seaweed Sample,
W76-08626 5A

Radioactivity in the Hydrosphere Recent Trends in Czech Studies,
W76-08627 5A

RADIOISOTOPES
Transuranium Nuclides in the Environment.
W76-08597 5C

Plutonium in the Aquatic Environment, Its Behaviour, Distribution and Significance,
W76-08599 5C

Distributions of Transuranium Nuclides in Sediment and Biota of the North Atlantic Ocean,
W76-08602 5B

Comparison of the Distributions in Marine Sediments of the Fallout Derived Nuclides Fe 55 and Pu 239,240, A New Approach to the Chemistry of Environmental Radionuclides,
W76-08603 5B

Plutonium Radionuclides in the Groundwaters at Enewetak Atoll,
W76-08607 5B

Radioruthenium in Coastal Waters,
W76-08619 5A

A Review of Methods for the Determination of Iodine-131 in the Marine Environment,
W76-08622 5A

Intercalibration of Methods for Radionuclide Measurements on a Seaweed Sample,
W76-08626 5A

Radioactivity in the Hydrosphere Recent Trends in Czech Studies,
W76-08627 5A

RAIN
A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

RAIN GAGES
Rain Gauge,
W76-08397 2B

RAINBOW TROUT
Studies on the Host Specificity of the Eyefluke Diplostomum Spathaceum, in Brown and Rainbow Trout,
W76-08302 5C

Electrophysiological Studies of Morpholine-Imprinted Coho Salmon (Oncorhynchus Kisutch) and Rainbow Trout (Salmo Gairdneri),
W76-08438 5C

The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

RAINFALL
Derivation of a Model Rain for the Dimensioning of Sewer Systems (Entwicklung eines Berechnungsregens fuer die Bemessung von Kanalnetzen),
W76-08253 5D

The Estimation of Local Rainfall by Sample Gauging,
W76-08348 2B

Rainfall and Floods in India During 1974 Southwest Monsoon Period,
W76-08732 2B

Extreme Rainfall Studies of the Brahmani, The Burhabalang, The Rushikulya and the Subarnarekha River Catchments,
W76-08733 2B

RAINFALL-RUNOFF RELATIONSHIPS
About the Problem of Direct Runoff Determination by Separation of the Hydrograph Components (K Otazke Urcenia Primaeho Odtoku Separaciou Prietokovych Vln),
W76-08238 2A

Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

The Development of a Snow Routine for the HBV-2 Model,
W76-08338 2C

RECHARGE
Dynamic Response of Aquifer Systems to Localized Recharge,
W76-08520 2F

RECYCLING
Recycling of Lime-Sulphide Unhairing Liquors - I, Small-Scale Trials,
W76-08179 5D

Waste Water Recycled For Use in Refinery Cooling Towers,
W76-08270 5D

Canadian Milling Practice for Water Re-Use,
W76-08272 5D

Recycling of Water in Poultry Processing Plants,
W76-08298 3E

Pickling with Hydrogen Peroxide Solutions,
W76-08479 5D

Pollution Problem Solver,
W76-08483 5D

Fiber Recovery Increases Water Re-Use, Reduces Treatment Cost,
W76-08489 5D

Metallic Recovery System,
W76-08493 5D

Sour Water Treatment Process.
W76-08496 5D

Resource Recovery: Possibilities and Pitfalls,
W76-08692 5D

RECYCLING

Refuse into Power,
W76-08693 5D

The Long Hard Road to the Effluent-Free Pulp Mill,
W76-08698 5D

The Effluent Treatment System and Utilization of Recycled Water in the Iyomishima Mill (Daio seishi Mishima kojo ni okeru sogo haisui shori to haisui no sairiyo),
W76-08700 5D

Recycling--Examples for Its Possibilities and Limits (Recycling--Beispiele fuer Moeglichkeiten und Grenzen),
W76-08701 5D

Chemical Clarification of Waste Water.
W76-08702 5D

The Effective Management of Waste.
W76-08704 5D

Studies Concerning Oil Removal from Mill Scale (Untersuchungen Zur Entoelung Von Walzzunder),
W76-08707 5D

Re-Use and Disposal of Waste Acids,
W76-08721 5D

REGIMES

Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

REGULATION

The Water Pollution Control Act of 1972 Institutional Assessment, Attitudes of Participants.
W76-08221 5G

REMOTE SENSING

The Study of Fresh-Water Lake Ice Using Multiplexed Imaging Radar,
W76-08138 2C

The Theory and Applications of Ocean Wave Measuring Systems at and Below the Sea Surface, on the Land, from Aircraft, and from Spacecraft,
W76-08145 7B

Evaluation of ERTS Data for Certain Hydrological Uses,
W76-08147 7C

Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

ERTS-1 Investigation of Wetlands Ecology,
W76-08319 2L

Evaluation of Glacier Mass Balance by Observing Variations in Transient Snowline Positions,
W76-08322 2C

Laser Applications to Atmospheric Sciences - A Bibliography,
W76-08323 10C

Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

Environmental Monitoring from Spacecraft Data,
W76-08532 5A

Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

Impact of Remote Sensing Upon the Planning, Management, and Development, and Development of Water Resources,
W76-08536 6B

The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

RENEWAL

The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

REPORTING SYSTEMS

Updating the Navy Environmental Protection Data Base to Incorporate Oil Spill Clean-Up Performance,
W76-08320 5B

RESEARCH AND DEVELOPMENT

Desalting Handbook for Planners.
W76-08584 3A

RESERVOIR

Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

RESERVOIR DESIGN

Some Theoretical Considerations in Reservoir Design,
W76-08518 8B

Preliminary Hydrologic Design of Small Flood Detention Reservoirs,
W76-08731 8B

RESERVOIR OPERATION

The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

RESERVOIR YIELD

Water Supply.
W76-08153 4A

RESERVOIRS

Coralville Water Quality Study, Annual Report, Water Year October 1, 1974 to September 30, 1975,
W76-08324 5A

A Brief Characterization of Shoals and Their Plant Cover in the Kremenchug Reservoir, (In Russian),
W76-08697 2H

RESISTIVITY

Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

RESOURCE RECOVERY

Resource Recovery: Possibilities and Pitfalls,
W76-08692 5D

RESOURCES DEVELOPMENT

Identification, Measurement, and Incorporation of Environmental Quality Objectives in Natural Resource Development,
W76-08101 6B

Efficient Resource Utilization Within a Regional Framework.
W76-08102 6B

RESPIRATION

A Simple Continuous-Flow Respirometer for Comparative Respiratory Changes in Medium-Sized Aquatic Organisms,
W76-08353 5C

RESPIROMETERS

A Simple Continuous-Flow Respirometer for Comparative Respiratory Changes in Medium-Sized Aquatic Organisms,
W76-08353 5C

RETAINING WALLS

Earth Pressure Observations on a Retaining Wall in Expansive Clay, Gougher Street Mail Exchange, Adelaide,
W76-08424 8D

RETURN FLOW

Spray Irrigation of Polutry Processing Wastewater,
W76-08165 5D

Water Quality in Irrigated Watersheds,
W76-08679 5B

REVERSE OSMOSIS

Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 1-5 MGD Plants, Plants for High Product Recovery,
W76-08118 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 3-25 MGD Low Pressure Plants,
W76-08119 3A

Development of Assymmetric Cellulose Triacetate Membranes for Seawater Desalination,
W76-08283 3A

Engineering and Economic Study of Reverse Osmosis Sea Water Desalting Plants, Design of 1-10 MGD Seawater Plants,
W76-08284 3A

Commercial Membrane Desalting Plants: Data and Analysis,
W76-08370 3A

Field Evaluation Testing of Reverse Osmosis High Pressure Pumps and Energy Recovery Turbines.
W76-08372 3A

Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

Reverse Osmosis System Corrects High BOD Wastes: Yields Net Operating Savings,
W76-08486 5D

REVIEWS
An Assessment of Eutrophication in Australian Inland Waters,
W76-08162 5C

Wastes from the Poultry Processing Industry,
W76-08292 3E

Methods of Ruthenium 106 Analysis in Marine Environmental Samples, - A Review,
W76-08617 5A

A Review of Methods for the Determination of Radioactive and Stable Zirconium in the Marine Environment,
W76-08620 5A

A Review of Methods for the Determination of Radioactive and Stable Silver in the Marine Environment,
W76-08621 5A

RHINE RIVER (WEST GERMANY)
Industry Takes the Lead in Cleaning Up the Rhine.
W76-08713 5D

RHODE ISLAND
Suspended Material Transport: Narragansett Bay Area, Rhode Island,
W76-08139 2L

Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

RHODE RIVER (CHESAPEAKE BAY)
Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

RISKS
Resource Recovery: Possibilities and Pitfalls,
W76-08692 5D

RIVER BASIN DEVELOPMENT
Efficient Resource Utilization Within a Regional Framework.
W76-08102 6B

RIVER FLOW
Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

Complex Width-Discharge Relations in Natural River Sections,
W76-08735 2E

RIVER SYSTEMS
Water Temperature Variations Within a Major River System,
W76-08340 2E

RIVERS
Arching of Fragmented Ice Covers,
W76-08149 2C

Age Composition and Growth of Aspius Aspius (L.) in the Lower Volga, (In Russian),
W76-08255 2I

Water Resources Planning for Rivers Draining into Mobile Bay, Part II: Non-Conservative Species Transport Models,
W76-08327 5B

Sediment Yields and Nutrient Loadings from Canadian Watersheds Tributary to Lake Erie: An Overview,
W76-08529 5B

Complex Width-Discharge Relations in Natural River Sections,
W76-08735 2E

Dissipation of Turbulent Energy in a Natural Channel,
W76-08744 8B

ROADS
Investigation of Roadway Drainage as Related to the Performance of Flexible Pavements,
W76-08534 8B

ROCK MECHANICS
International Association of Engineering Geology, Proceedings of the Second International Congress, Volume 2.
W76-08418 8E

ROMANIA (DANUBE RIVER FLOOD PLAIN)
Cladocera and Gastropoda Population Ecology in the Danube Flood Plain, (In Romanian),
W76-08308 2H

ROOTED AQUATIC PLANTS
Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

RUBBER
Methane Fermentation of Rubber (Hevea Brasiliensis) Latex Effluent,
W76-08722 5D

RUBBER LATEX EFFLUENT
Methane Fermentation of Rubber (Hevea Brasiliensis) Latex Effluent,
W76-08722 5D

RUGOSITY
Channel Flow Over Permeable Beds of Graded Spheres,
W76-08511 8B

RUM DISTILLERY WASTES
Rum Distillery Wastes: Laboratory Studies on Aerobic Treatment,
W76-08469 5D

RUNOFF
Use and Misuse of the Universal Soil Loss Equation,
W76-08120 2J

On-Site Runoff Depletion at Three Impoundments,
W76-08122 4A

Snowmelt-Runoff Model for Stream Flow Forecasts,
W76-08131 2E

Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

RUNOFF COEFFICIENT
Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

RUNOFF CURVE NUMBER
Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

Urban Hydrology for Small Watersheds.
W76-08509 4D

RUNOFF MODEL
Snowmelt-Runoff Model for Stream Flow Forecasts,
W76-08131 2E

RUTHENIUM
Methods of Ruthenium 106 Analysis in Marine Environmental Samples, - A Review,
W76-08617 5A

Determination of Radionuclides of Ce, Co, Fe, Ru, Zn and Zr in Seawater by Preconcentration of Colloidal Manganese Dioxide, Application to the Determination of Low Level Ruthenium 106,
W76-08618 5A

Radioruthenium in Coastal Waters,
W76-08619 5A

A Study of the Stability of Some Radionuclides in Seawater,
W76-08625 5A

RYE
Carbohydrate Transformation in Wheat and Rye Plants Under Effect of Flooding in the Autumn-Winter Period, (In Russian),
W76-08307 3F

SAGINAW BAY (MICH)
Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

SALINE RIVER (ARK)
Flood Plain Information: Saline River and Tributaries, Benton, Arkansas.
W76-08389 4A

SALINE WATER
Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

SALINE WATER-FRESHWATER INTERFACES
Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

SALINITY
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

Shooting Models for Salinity and Coliform,
W76-08134 5B

Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

Effects of Temperature and Salinity on the Survival of Winter Flounder Embryos,
W76-08437 5C

The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

SALINITY EFFECTS
Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

SALINITY TRENDS
Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

SALMON
Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

SALMONID HOMING
Electrophysiological Studies of Morpholine-Imprinted Coho Salmon (Oncorhynchus Kisutch) and Rainbow Trout (Salmo Gairdneri),
W76-08438 5C

SALMONIDS
Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

Fish Diversion Systems and Biological Investigation of Horizontal Traveling Screen Model VII,
W76-08648 8I

SALT BALANCE
Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

SALT MARSHES
Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

SALT RECOVERY PROCESS
The Long Hard Road to the Effluent-Free Pulp Mill,
W76-08698 5D

SALT RECOVERY PROCESS (REEVE/RAPON)
Rapson Idea Set for Mill Trials.
W76-08500 5D

SALTCEDAR WATER USE
Water Use by Saltcedar as Measured by the Water Budget Method,
W76-08573 2D

SALVELINUS-ALPINUS
Some Characteristics of Fat Metabolism in Two Forms of Char Salvelinus Alpinus (L.) From Lake Azabach (Kamchatka), (In Russian),
W76-08310 2H

SALVINIA NATANS
Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

SAN FELIPE LAKE (CALIF)
Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

SAN FRANCISCO BAY
Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

SAN FRANCISCO BAY (CALIF)
Distribution and Movement of Zinc and Other Heavy Metals in South San Francisco Bay, California,
W76-08561 5B

SANDSTONES
Transfer of Boron and Tritiated Water Through Sandstone,
W76-08547 5B

SAPROBITY
The Influence of Water Quality on Accumulation of Heavy Metals in Aquatic Organisms,
W76-08456 5C

SATELLITES (ARTIFICIAL)
Evaluation of ERTS Data for Certain Hydrological Uses,
W76-08147 7C

Impact of Remote Sensing Upon the Planning, Management, and Development, and Development of Water Resources,
W76-08536 6B

Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

SAVANNAH RIVER (GA)
Pollutant Transport in Natural Streams,
W76-08329 5B

SAVANNAH RIVER (SC)
Savannah River Biological Survey, Lower Three Runs.
W76-08593 5C

Savannah River Biological Survey.
W76-08594 5C

SCANDINAVIA
The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

SCENEDESMUS
Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

SCHIZOTHORAX-INTERMEDIUS-EURY-CEPHALU
Some Problems of the Ecology of the Sary-Chilek Marinka Schizothorax Intermedius Eury-Cephalus Spelter, (In Russian),
W76-08243 2H

SCOTLAND
The Role of Organic Detritus in the Formation of Distinctive Sandy Tidal Flat Sedimentary Structures, Tay Estuary, Scotland,
W76-08524 2L

SCOURING (RAW WOOL)
A Modified Raw-Wool Scouring System for Easier Effluent Treatment,
W76-08717 5D

SCREENS
Perforated-Pipe Water Intake for Fish Protection,
W76-08137 8I

Traveling Screens for Turbine Intakes of Hydroelectric Dams,
W76-08647 8I

Fish Diversion Systems and Biological Investigation of Horizontal Traveling Screen Model VII,
W76-08648 8I

Mechanical Operation of Horizontal Traveling Screen Model VII,
W76-08649 8I

Numbers of Individuals and Injury Rates of Fishes Caught on Revolving Screens at the P. H. Robinson Generating Station,
W76-08653 8I

Conventional Fish Screening Systems and Some Promising Alternatives,
W76-08655 8I

Experimental Studies in Guiding Marine Fishes of Southern California with Screens and Louvers,
W76-08659 8I

Development of Biological Design Criteria for Fish Screens and Barriers,
W76-08662 8I

SEA OF JAPAN
Organic Carbon, Phosphorus and Nitrogen in the Waters of the Sea of Japan, (In Russian),
W76-08313 5A

SEA WATER
The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

The Plutonium Content of Pacific Ocean Waters,
W76-08601 5C

Environmental and Public Health Consequences of the Controlled Disposal of Transuranic Elements to the Marine Environment,
W76-08604 5C

Double-Tracer Studies to Optimize Conditions for the Radiochemical Separation of Plutonium from Large Seawater Samples,
W76-08610 5A

Radioruthenium in Coastal Waters,
W76-08619 5A

SEABED DRIFTERS
A Seabed Drifter Study of Near-Bottom Circulation in North Carolina Shelf Waters,
W76-08350 2L

SEARCH OPTIMIZATION ROUTINE
An Optimization Technique Adapted to USDAHL-74 Revised Model of Watershed Hydrology,
W76-08523 2A

SEASONAL
Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

SECONDARY FLOW
Simulation of Hydraulic Processes in Open Channels,
W76-08344 8B

SEDIMENT DISTRIBUTION
Surficial Sediments of Lake Erie,
W76-08725 2J

Distribution, Composition, and Transport of Suspended Particulate Matter in the Vicinity of Willapa Submarine Canyon, Washington,
W76-08737 2L

SEDIMENT LOAD
Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

SEDIMENT RESUSPENSION
Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

SEDIMENT TRANSPORT
Suspended Material Transport: Narragansett Bay Area, Rhode Island,
W76-08139 2L

Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

Watershed Soil Detachment and Transportation Factors,
W76-08551 2J

The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

SEDIMENT YIELD
Watershed Soil Detachment and Transportation Factors,
W76-08551 2J

SEDIMENTATION
The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

A Physical Model for the Rate of Deposition of Fine-Grained Sediments in the Deep Sea,
W76-08736 2J

Distribution, Composition, and Transport of Suspended Particulate Matter in the Vicinity of Willapa Submarine Canyon, Washington,
W76-08737 2L

SEDIMENTATION RATES
Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

SEDIMENTS
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

The Role of Organic Detritus in the Formation of Distinctive Sandy Tidal Flat Sedimentary Structures, Tay Estuary, Scotland,
W76-08524 2L

Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Sediment Yields and Nutrient Loadings from Canadian Watersheds Tributary to Lake Erie: An Overview,
W76-08529 5B

Distributions of Transuranium Nuclides in Sediment and Biota of the North Atlantic Ocean,
W76-08602 5B

Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

Surficial Sediments of Lake Erie,
W76-08725 2J

Cultural Impact on the Geochemistry of Sediments in Lake Erie,
W76-08727 2J

SEEPAGE
On-Site Runoff Depletion at Three Impoundments,
W76-08122 4A

Application of the Finite Element Method in Foundation Engineering (Die Anwendung der Methode der Finiten Elemente in der Grundbaupraxis),
W76-08423 8D

SELF PURIFICATION
Introduction to Hydrobiology. Hydrobiology: A Compendium for Engineers and Natural Scientists, (In German),
W76-08315 5C

Self-Purification Capacity of Impoundments,
W76-08358 5C

SEPARATION TECHNIQUES
Coanda Effect Oil-Water Separator,
W76-08209 5G

Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

Floating Oil Barrier,
W76-08396 5G

Apparatus for Pumping Oil-Water Mixture from a Collection Vessel of a Floating Oil Collector into Settling Tanks,
W76-08403 5G

Recovery and Separation of Chemicals Produced During Kraft Pulping Operations,
W76-08467 5D

Double-Tracer Studies to Optimize Conditions for the Radiochemical Separation of Plutonium from Large Seawater Samples,
W76-08610 5A

Determination of Plutonium in the Marine Environment,
W76-08615 5A

Studies Concerning Oil Removal from Mill Scale (Untersuchungen Zur Entoelung Von Walzzunder),
W76-08707 5D

High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

SETTLING BASINS
Liquid Conditioning and Settling Tanks,
W76-08203 5D

Settling Tank,
W76-08495 5D

SEVAN TROUT
Rearing the Sevan Trout at the Aigerlich Trout Pond Fishery, (In Armenian),
W76-08371 2I

SEVIN
Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

SEWAGE
A New Sewage Treatment Technique for the Purpose of Nitrogen Elimination (I): Biological Denitrogenization of Urban Sewage (Chisso jokyo o mokuteki to shite atarashii gesui shori gijutsu (I),--Toshi gesui kara no seibutsugakuteki datsu chissoho ni tsuite),
W76-08274 5D

Bacterial Contamination of Perennial Grasses in Overhead Irrigation with Sewage, (In Russian),
W76-08582 5D

SEWAGE DISPOSAL
Oxygen Relationships in a Soil Treated with Sewage Effluent,
W76-08231 5D

SEWAGE EFFLUENTS
DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

SEWAGE TREATMENT
Combination Sewage Treatment and Cooling System,
W76-08242 5D

Sewage Cleaned with Coal,
W76-08263 5D

Biological Changes in the South St. Paul Sewage Treatment Plant Before and After Treatment with FeCl3 and Nalcolyte 675 Coagulating Agents,
W76-08290 5D

Introduction to Hydrobiology. Hydrobiology: A Compendium for Engineers and Natural Scientists, (In German),
W76-08315 5C

The Kinetics of Microbial Nitrification,
W76-08369 5D

Method for Treating Sewage Water,
W76-08394 5D

Method and Apparatus for Drying Moisture-Containing Solids, Particularly Domestic Refuse and Sludge Cakes,
W76-08404 5D

Process of Preparing Sewage Sludge for Dewatering,
W76-08409 5D

Oxygen, and Other Innovations, Help Lick Tough Waste Problem,
W76-08715 5D

SEWERAGE
Derivation of a Model Rain for the Dimensioning of Sewer Systems (Entwicklung eines Berechnungsregens fuer die Bemessung von Kanalnetzen),
W76-08253 5D

Town Halts Infiltration.
W76-08257 5D

Municipal Industrial Waste Program Nets $8.9 Million in Two Years.
W76-08712 5D

SEWERS
Land-Use Model For Service Area Projection,
W76-08226 5G

Polyethylene Pipe Solves Problem of Force Main Sewer Line Installation Across Inland Waterway.
W76-08236 8F

Apparatus for Flushing Sewers,
W76-08262 5D

SHAGAWA LAKE (MINN)
A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

SHEAR FLOW
Three-Dimensional Pollutant Modeling in Shear Flow,
W76-08740 5B

SHOALS
A Brief Characterization of Shoals and Their Plant Cover in the Kremenchug Reservoir, (In Russian),
W76-08697 2H

SHORE PROTECTION
The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

Field Performance of Permeable Breakwater,
W76-08684 8A

SILAGE YIELDS
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

SILTS
Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

SILVER
A Review of Methods for the Determination of Radioactive and Stable Silver in the Marine Environment,
W76-08621 5A

A Method for the Rapid Enrichment and Determination of Silver-110m and Iodine-131 from Seawater,
W76-08624 5A

SILVER IODIDE
The Responses of Soils and Soil Microorganisms to Silver Iodide Weather Modification Agents,
W76-08670 2G

SILVERSIDES
Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

SIMULATION ANALYSIS
Simulation of Hydraulic Processes in Open Channels,
W76-08344 8B

Watershed Soil Detachment and Transportation Factors,
W76-08551 2J

Calculated Drainage Water Compositions and Salt Burdens Resulting from Irrigation with River Waters in the Western United States,
W76-08671 5B

Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

Implementation of Hydrologic Models at Goddard Space Flight Center.
W76-08745 2A

SINKHOLE BASINS
Hydrology of the Three Sinkhole Basins in Southwestern Seminole County, Florida,
W76-08572 4A

SINKS
Hydrology of the Three Sinkhole Basins in Southwestern Seminole County, Florida,
W76-08572 4A

SKUNK RIVER BASIN (IOWA)
Efficient Resource Utilization Within a Regional Framework.
W76-08102 6B

SLEET
A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

SLOPE PROTECTION
Schriftenreih, (Otto-Graf-Institut), (In German).
W76-08425 8D

SLOPE STABILIZATION
Schriftenreih, (Otto-Graf-Institut), (In German).
W76-08425 8D

SLUDGE
Liquid Conditioning and Settling Tanks,
W76-08203 5D

Chemfix Treatment System for Liquid and Sludge Effluents.
W76-08269 5D

Evaluation of Mineralization Processes for SRP Wastes,
W76-08595 5G

SLUDGE TREATMENT
Method and Apparatus for Drying Moisture-Containing Solids, Particularly Domestic Refuse and Sludge Cakes,
W76-08404 5D

Process of Preparing Sewage Sludge for Dewatering,
W76-08409 5D

SLUG TEST
Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case,
W76-08124 2F

SLURRIES
Slurry-Burning Process.
W76-08498 5D

SMOLT
Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

SNAILS
Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

SNOW COVER
Evaluation of Glacier Mass Balance by Observing Variations in Transient Snowline Positions,
W76-08322 2C

Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

SNOW ROUTINE
The Development of a Snow Routine for the HBV-2 Model,
W76-08338 2C

SNOWFALL
A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

SNOWMELT
Snowmelt-Runoff Model for Stream Flow Forecasts,
W76-08131 2E

Alternative Methods of Estimating Snow Water Parameters,
W76-08259 2C

SNOWPACKS
Snow-Regulating Role of the Forest Belts in the Steppes of the Krasnoyarsk Krai, (In Russian),
W76-08383 2C

SOAKER IRRIGATION
Adjustable Soaker Hose Support Assembly,
W76-08197 3F

SOAPS
Crude Soap Recovers Mercury from Water,
W76-08474 5D

SOCIAL ASPECTS
Identification, Measurement, and Incorporation of Environmental Quality Objectives in Natural Resource Development,
W76-08101 6B

SOCIAL CHANGE
The Water Pollution Control Act of 1972 Institutional Assessment, Attitudes of Participants.
W76-08221 5G

SOCIAL PARTICIPATION
The Water Pollution Control Act of 1972 Institutional Assessment, Attitudes of Participants.
W76-08221 5G

SODIUM ADSORPTION RATIO
A Comparative Study of the Effect of Qualities of Irrigation Water on Different Soils,
W76-08301 3C

SOIL ANALYSIS
Oxygen Relationships in a Soil Treated with Sewage Effluent,
W76-08231 5D

Schriftenreih, (Otto-Graf-Institut), (In German).
W76-08425 8D

SOIL BACTERIA
Nitrate Reduction and Associated Microbial Populations in a Ponded Hanford Sandy Loam,
W76-08546 5G

SOIL CHEMISTRY
The Responses of Soils and Soil Microorganisms to Silver Iodide Weather Modification Agents,
W76-08670 2G

The Impact of Molybdenum-Enriched Irrigation Water on Agricultural Soils Near Brighton, Colorado,
W76-08675 5B

SOIL COMPACTION
Pore Size Distribution of Compacted Soils After Critical Region Drying,
W76-08416 2G

Artificially Simulating the Geological History of Clay,
W76-08421 8D

Application of the Finite Element Method in Foundation Engineering (Die Anwendung der Methode der Finiten Elemente in der Grundbaupraxis),
W76-08423 8D

SOIL CONSERVATION
Use and Misuse of the Universal Soil Loss Equation,
W76-08120 2J

SOIL CONTAMINATION
Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

SOIL COVER COMPLEX
Urban Hydrology for Small Watersheds.
W76-08509 4D

SOIL DYNAMICS
Application of the Finite Element Method in Foundation Engineering (Die Anwendung der Methode der Finiten Elemente in der Grundbaupraxis),
W76-08423 8D

SOIL EROSION
Use and Misuse of the Universal Soil Loss Equation,
W76-08120 2J

Soil Loss from Illinois Farms - Economic Analysis of Productivity Loss and Sedimentation Damage,
W76-08533 4D

Fundamental Aspects of Erosion of Cohesive Soils,
W76-08540 2J

SOIL INVESTIGATIONS
Rate of Chloride and Water Movement in Southern California Soils,
W76-08545 2G

SOIL LOSS EQUATION
Use and Misuse of the Universal Soil Loss Equation,
W76-08120 2J

SOIL MANAGEMENT
Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

Deep Tillage of Graded-Furrow-Irrigated Pullman Clay Loam,
W76-08543 3F

SOIL MICROORGANISMS
The Responses of Soils and Soil Microorganisms to Silver Iodide Weather Modification Agents,
W76-08670 2G

SOIL MOISTURE
Soil Moisture Regime and Pigment Content in Leaves of Cereals, (In Belorussian),
W76-08304 3F

Change of the Content and State of Pigments in Leaves of Male and Female Hemp in Relation to Nutrition and Soil Moisture Content, (In Russian),
W76-08306 2I

Infiltration Analysis and Perturbation Methods 1. Absorption with Exponential Diffusivity,
W76-08334 2G

Resistance-Mass Transfer Method for Estimating Evapotranspiration: Comparison with Lysimetric Measurements in Irrigated Sorghum,
W76-08588 2D

The Use of Likelihood Functions to Fit Conceptual Models with More than One Dependent Variable,
W76-08729 2G

Measurement of Soil Moisture in Poona Black Cotton Soil Using an Infra-Red Moisture Balance,
W76-08734 2G

SOIL MOISTURE METERS
Measurement of Soil Moisture in Poona Black Cotton Soil Using an Infra-Red Moisture Balance,
W76-08734 2G

SOIL PRESSURE
Earth Pressure Observations on a Retaining Wall in Expansive Clay, Gougher Street Mail Exchange, Adelaide,
W76-08424 8D

SOIL PROPERTIES
Deep Tillage of Graded-Furrow-Irrigated Pullman Clay Loam,
W76-08543 3F

SOIL STABILITY
Application of the Finite Element Method in Foundation Engineering (Die Anwendung der Methode der Finiten Elemente in der Grundbaupraxis),
W76-08423 8D

SOIL STABILIZATION
Soil Stabilization with Powdered and Coarse Quicklime,
W76-08422 8D

SOIL SWELLING
Properties of Expansive Clay Soils; Report 2, A Numerical Procedure for Predicting Heave with Time,
W76-08420 8D

SOIL TEMPERATURE
Thermal Properties of Fine Textured Mollisols Under Varying Moisture Conditions,
W76-08364 2G

SOIL TESTS
Artificially Simulating the Geological History of Clay,
W76-08421 8D

Schriftenreih, (Otto-Graf-Institut), (In German).
W76-08425 8D

SOIL WATER MOVEMENT
Rate of Chloride and Water Movement in Southern California Soils,
W76-08545 2G

SOIL-WATER-PLANT RELATIONSHIPS
Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

SOILS
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

A Comparative Study of the Effect of Qualities of Irrigation Water on Different Soils,
W76-08301 3C

Rate of Chloride and Water Movement in Southern California Soils,
W76-08545 2G

SOLAR RADIATION
The Effect of Controlled Eutrophication on Solar Radiation Penetrating into Ponds, (In Polish),
W76-08305 5C

Ocean Thermal Energy Conversion.
W76-08366 8C

Effect of Solar Energy and Water on Plant Productivity (In Bulgarian),
W76-08576 2I

Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

SOLID WASTES
The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

Refuse into Power,
W76-08693 5D

SOLUTION CONDUCTIVITY
Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

SOLVENT EXTRACTIONS
Radiochemical Determination of Plutonium in Marine Samples by Ion Exchange and Solvent Extraction,
W76-08614 5A

SORGHUM
Limited Irrigation of Grain Sorghum in Alternating Strips with Wheat,
W76-08542 3F

Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

Resistance-Mass Transfer Method for Estimating Evapotranspiration: Comparison with Lysimetric Measurements in Irrigated Sorghum,
W76-08588 2D

Comparison of a Modified Brown-Rosenberg Resistance Model with other Evapotranspiration Estimation Methods: Tests in an Irrigated Sorghum Field,
W76-08589 2D

Thermal Scanner Measurements of Crop Temperatures to Estimate Evapotranspiration,
W76-08591 2D

SORPTION
Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

SOUR WATER STRIPPER
Sour Water Treatment Process.
W76-08496 5D

SOUTH AFRICA (PONGOLA RIVER)
Energy Content of the Benthos and Epifauna in the Pongola River, Natal, (In Afrikaans),
W76-08158 2I

SOUTH CAROLINA
Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

Savannah River Biological Survey, Lower Three Runs.
W76-08593 5C

Savannah River Biological Survey.
W76-08594 5C

Evaluation of Mineralization Processes for SRP Wastes,
W76-08595 5G

SOUTH DAKOTA
Geology and Water Resources of Marshall County, South Dakota--Part 1: Geology and Water Resources,
W76-08558 4A

SOUTHEAST US
ERTS-1 Investigation of Wetlands Ecology,
W76-08319 2L

SOYBEAN OIL REFINERY
Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

SOYBEANS
Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

Thermal Scanner Measurements of Crop Temperatures to Estimate Evapotranspiration,
W76-08591 2D

SPATIAL DISTRIBUTION
Method of Studying the Spatial Distribution of Organisms, (In Russian),
W76-08176 7B

SPAWNING
Weight Loss, Mortality, Feeding, and Duration of Residence of Adult American Shad, Alosa Sapidissima in Fresh Water,
W76-08433 5C

Electrophysiological Studies of Morpholine-Imprinted Coho Salmon (Oncorhynchus Kisutch) and Rainbow Trout (Salmo Gairdneri),
W76-08438 5C

Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

SPECIFICATIONS
Preparation of Plans and Specifications for Pollution Abatement Activities in Cherry Creek Watershed, Maryland.
W76-08385 5G

SPECTROPHOTOMETRY
Methods of Ruthenium 106 Analysis in Marine Environmental Samples, - A Review,
W76-08617 5A

A Rapid Method for the Determination of Radioiodine in Suspended Matter and Seawater,
W76-08623 5A

SPECTROSCOPY
Detection of Salts of 2,4-D in Aqueous Solution by Laser Raman Spectroscopy,
W76-08254 5A

SPOIL BANKS
Guidelines for Material Placement in Marsh Creation,
W76-08325 5G

SPRAY IRRIGATION TREATMENT
Spray Irrigation of Polutry Processing Wastewater,
W76-08165 5D

SPRAYING
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

SPRING
Nitrogen Utilization During Spring Blooms of Marine Phytoplankton in Bedford Basin, Nova Scotia, Canada,
W76-08691 5C

SPRINKLER IRRIGATION
Ground Treatment Apparatus,
W76-08393 3F

Graphic Determination of Sub-Main Pipe Size for Solid-Set Sprinkler Irrigation on Steep, Non-Uniform Slopes,
W76-08682 3F

STABILITY
Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

STANDARDS
What Does a 'Clean' Environment Cost,
W76-08150 5G

A Study on Marine Trace Elements and CSK Standards, (In Japanese),
W76-08311 2L

STANDING CROPS
Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

STARVATION (FISH)
Survival Rate of Starving Carp (Cyprinus Carpio Linne), (In Russian),
W76-08552 5C

STATISTICAL METHODS
Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

STATISTICS
Water Resources of the World, Selected Statistics.
W76-08507 7C

STEEL
High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

STEEL MAKING PROCESSES
Ims-Grangcold Pelletizing System for Steel Mill Wastes Material,
W76-08491 5D

STERILANTS
Sterilization of Holding Tanks and Toilet Bowls by Quaternary Compounds,
W76-08201 5D

STOCHASTIC MODELS
Simulation of Hydraulic Processes in Open Channels,
W76-08344 8B

STOMATA
Dependence of Stomatal Number and Size in Juglans Regia L. on Ecological Conditions, (In Bulgarian),
W76-08668 2I

STORM DRAINS
Development of Storm Drainage Cost Functions,
W76-08227 3D

STORM RUNOFF
Pumps Free City from Lake Erie Flooding.
W76-08250 8C

Influence of the Local Precipitation Quantity on the Loading of Water Bodies with Mixed Water (Der Einfluss der Oertlichen

Neiderschlagshoehe auf die Belastung der Gewaesser Mit Mischwasser),
W76-08258 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

STORM SEWERS
Water Pollution Abatement Technology: Capabilities and Costs, Urban Runoff.
W76-08222 5G

STORM WATER
Water Pollution Abatement Technology: Capabilities and Costs, Urban Runoff.
W76-08222 5G

STORMS
How Much Precipitation Goes to Infiltration During a Storm Period,
W76-08339 2A

STRAITS
Water Volume Transport and Oscillatory Current Flow Through the Straits of Mackinac,
W76-08128 2H

STREAM DRIFT NETS
An Aquatic Technique for Collecting Small Adult Insects,
W76-08574 7B

STREAMFLOW
Snowmelt-Runoff Model for Stream Flow Forecasts,
W76-08131 2E

Water Temperature Variations Within a Major River System,
W76-08340 2E

The Use of Likelihood Functions to Fit Conceptual Models with More than One Dependent Variable,
W76-08729 2G

STREAMFLOW FORECASTING
Flood Plain Information: Alamo and Ulatis Creeks, Vacaville, California.
W76-08377 4A

Interstation Correlation of Peak-Flow Estimates,
W76-08555 4A

STREAMS
Pollutant Transport in Natural Streams,
W76-08329 5B

Dynamic Response of Aquifer Systems to Localized Recharge,
W76-08520 2F

STRIP MINE WASTES
Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

STRIP MINES
Control of Acid Mine Drainage.
W76-08156 5G

STRIPED BASS
Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

STRUYA TREATMENT INSTALLATIONS
Drinking Water Purification in Industrially Manufactured Compact Installations of the Type 'Struya', (In English),
W76-08579 5F

STURGEON
Biological Background of the New Element of Sturgeon Artificial Rearing Methods, (In Russian),
W76-08663 8I

SUBLETHAL EFFECTS
Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

SUBMERGENCE
Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

SUBSURFACE DRAINAGE
Outflow from Various Subsurface Drainage Materials,
W76-08669 4A

SUBSURFACE IRRIGATION
Underground Irrigation System,
W76-08406 3F

SUBSURFACE WATERS
Research Studies on the Fauna of the Greek Subterranean Waters, (In French),
W76-08296 2L

SUCCESSION
Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

SUCTION DREDGES
Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

SUDBURY (ONTARIO)
Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

SUGAR CREEK WATERSHED (OKLA)
On-Site Runoff Depletion at Three Impoundments,
W76-08122 4A

SULFATES
Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

SULFURIC ACID
Sulphuric Acid Containing Rinses, Purification,
W76-08506 5D

SUPERVISORY CONTROL (POWER)
Load and Voltage Control Algorithms for Grand Coulee Powerplant,
W76-08112 8C

SURFACE-ACTING AGENTS
Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

SURFACE RUNOFF
Nitrogen and Phosphorus Losses from Winter Disposal of Dairy Manure,
W76-08159 5C

SURFACE WATER TEMPERATURE
Lake Huron Surface Water Temperature, May-November, 1966,
W76-08141 2H

SURFACE WATERS
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

Water Resources Data for California, 1974: Part 1. Surface Water Records--Volume 2: Northern Great Basin and Central Valley.
W76-08556 7C

Geology and Water Resources of Marshall County, South Dakota--Part 1: Geology and Water Resources,
W76-08558 4A

SURFACTANTS
Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

SURFICIAL SEDIMENTS
Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

SURVEYS
An Ecologic Survey of Lake Endine, (In Italian),
W76-08244 5C

Canadian Milling Practice for Water Re-Use,
W76-08272 5D

Savannah River Biological Survey, Lower Three Runs.
W76-08593 5C

Savannah River Biological Survey.
W76-08594 5C

SUSPENDED LOAD
Suspended Material Transport: Narragansett Bay Area, Rhode Island,
W76-08139 2L

SUSPENDED SOLIDS
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

Fine-Dispersed Fraction of Suspended Organic Matter in the East Pacific Waters, (In Russian),
W76-08314 5C

Distribution, Composition, and Transport of Suspended Particulate Matter in the Vicinity of Willapa Submarine Canyon, Washington,
W76-08737 2L

SWEDEN
The Development of a Snow Routine for the HBV-2 Model,
W76-08338 2C

SYNTHETIC FLOWS
A Reconsideration of the Fiering Two-Station Model,
W76-08519 4A

SYNTHETIC HYDROLOGY
A Reconsideration of the Fiering Two-Station Model,
W76-08519 4A

SYSTEMATICS
Morgantown Entrainment. Part IV. Phytoplankton Taxonomic Studies,
W76-08643 5C

SYSTEMS ANALYSIS
Development Trends in Methods Used to Model Populations and Communities,
W76-08213 8I

Transient Water Quality Modeling in Streams,
W76-08730 5B

TABULAR PROCEDURES
Infiltration into Increasingly Permeable Soils,
W76-08516 2G

TANNERY WASTE
New Approaches Point to Better Economies in Hide Processing,
W76-08288 3E

TANNERY WASTES
Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

Report on Methods of Chrome Recovery and Reuse from Spent Chrome Tan Liquor,
W76-08174 5D

Some Aspects of Tannery Effluent Control,
W76-08175 5D

Treatment of Tannery Wastewater from Bona Allen, Inc., Buford, Georgia,
W76-08177 5D

Recycling of Lime-Sulphide Unhairing Liquors - I, Small-Scale Trials,
W76-08179 5D

The Role of High Rate Bio-Filters in the Leather Industry,
W76-08180 5D

A Very Rapid Liming and Tanning Process Without Effluent,
W76-08181 3E

No-Effluent Tannery Processes,
W76-08182 3E

Recent Investigations into the Disposal of Tannery Waste Water,
W76-08183 5D

Alternatives for Reducing Water Pollution in Cattlehide Processing and Tanning,
W76-08285 3E

Combined Treatment of Leather Tanning and Municipal Wastes at Grand Haven, Michigan,
W76-08294 5D

Trivalent Chromium in Tannery Effluents,
W76-08295 5D

TASTAKA POND
Abundance and Biomass of Bacterioplankton of 'Tastaka' Ponds, (In Russian),
W76-08664 5C

TAY ESTUARY (SCOTLAND)
The Role of Organic Detritus in the Formation of Distinctive Sandy Tidal Flat Sedimentary Structures, Tay Estuary, Scotland,
W76-08524 2L

TECHNOLOGY
Innovative Technologies for Water Pollution (Abatement).
W76-08220 5G

TEES RIVER (ENGLAND)
Water Temperature Variations Within a Major River System,
W76-08340 2E

TELEASTS
Marine Ecology of the Northern Euboea: I. Preliminary Data on the Zooplankton and the Ichtyoplankton, (In French),
W76-08106 2L

TELEMETRY
Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

TEMPERATURE
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

Steady Stratified Circulation in a Cavity,
W76-08136 2H

Lake Huron Surface Water Temperature, May-November, 1966,
W76-08141 2H

Effects of Temperature and Salinity on the Survival of Winter Flounder Embryos,
W76-08437 5C

Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

TEMPERATURE VARIATIONS
Water Temperature Variations Within a Major River System,
W76-08340 2E

TEMPORAL DISTRIBUTION
Studies on the Animal Communities in Two North Florida Salt Marshes. Part I. Fish Communities,
W76-08161 2L

TERTIARY TREATMENT
Process of Preparing Sewage Sludge for Dewatering,
W76-08409 5D

TESTING PROCEDURES
Considerations of Testing the Accumulation of Pesticides by Means of Artificial Food Chains,
W76-08361 5A

Properties of Expansive Clay Soils; Report 2, A Numerical Procedure for Predicting Heave with Time,
W76-08420 8D

TEXAS
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

TEXTILES
Water Pollution Abatement Technology, Capabilities and Costs, Textile Industry.
W76-08186 5G

Treatment of Dye Wastes with Granular Activated Carbon,
W76-08716 5D

A Modified Raw-Wool Scouring System for Easier Effluent Treatment,
W76-08717 5D

Cleaning of Industrial Effluent,
W76-08719 5D

Canton's Futuristic Waste Treatment System,
W76-08720 5D

THEORETICAL ANALYSIS
Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case,
W76-08124 2F

Some Theoretical Considerations in Reservoir Design,
W76-08518 8B

THEORETICAL CONSIDERATIONS
Some Theoretical Considerations in Reservoir Design,
W76-08518 8B

THERMAL CONDUCTIVITY
Determination of Traces of Carbon in Solid and Liquid Wastes of Chemical Plants by Means of Thermal Conductivity Measurements (Bestimmung Von Spuren Kohlenstoff in Festen Und Fluessigen Abfallstoffen Der Chemischen Industrie Mit Hilfe Der Waermeleitfaehigkeitsmessung),
W76-08499 5A

THERMAL DEGRADATION
Re-Use and Disposal of Waste Acids,
W76-08721 5D

THERMAL LAG
On a Thermal Lag in the North Atlantic Ocean During a Climatic Change,
W76-08127 2L

THERMAL POLLUTION
Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

Thermal-Hydraulic Model Study of Offshore Discharge System for Kahe Power Plant, Hawaii,
W76-08508 5B

Savannah River Laboratory Environmental Transport and Effects Research Annual Report - 1974.
W76-08596 5B

Entrainment and Thermal Effects on a Mysid Shrimp and Striped Bass in the Sacramento-San Joaquin Delta,
W76-08631 5C

Summary of Entrainment Research at the Millstone Point Nuclear Power Station, 1970 to 1972,
W76-08632 5C

One-Dimensional Temperature Predictions in Unsteady Flows,
W76-08738 5B

Numerical Prediction of Thermal-Regime of Rivers,
W76-08739 5B

THERMAL POWERPLANTS
A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part II: Design Concept,
W76-08661 8I

THERMAL PROPERTIES
Method for Locating and Evaluating Geothermal Sources of Energy by Sensing Electrostatic Voltage Gradients,
W76-08204 4B

Thermal Properties of Fine Textured Mollisols Under Varying Moisture Conditions,
W76-08364 2G

THERMAL RADIATION
Canopy Temperature Measurement of Sorghum and Millet with Leaf Thermocouple and Infrared Thermometer Techniques,
W76-08590 2D

THERMAL SCANNER
Great Plains Evapotranspiration by a Resistance Model Using Remotely Sensed Thermal Imagery,
W76-08585 2D

THERMAL STRATIFICATION
Steady Stratified Circulation in a Cavity,
W76-08136 2H

THERMAL STRESS
Entrainment Studies on Hudson River Organisms,
W76-08633 5C

Entrainment Studies at Turkey Point on Biscayne Bay: Have Thermal Effects Affected the Plankton of Biscayne Bay,
W76-08645 5C

TIDAL MARSHES
Studies on the Animal Communities in Two North Florida Salt Marshes. Part I. Fish Communities,
W76-08161 2L

TIDAL WATERS
The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

Computation of Tidal Flow in Well-Mixed Estuaries,
W76-08741 2L

TIDES
Computation of Tidal Flow in Well-Mixed Estuaries,
W76-08741 2L

TILE DRAINS
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

TILE EFFLUENT
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

TILLAGE DEPTH
Deep Tillage of Graded-Furrow-Irrigated Pullman Clay Loam,
W76-08543 3F

Nitrate, Phosphate, and Potassium Movement into Drainage Lines under Three Soil Management Systems,
W76-08680 5B

TITANIUM
Clearing of Titanium- and Aluminium-Containing Effluent Waters.
W76-08708 5D

TOLEDO (OHIO)
Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

TOWERS
The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

TOXICANTS
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

TOXICITY
Toxic Action of Copper on the Gills of Carp (Cyprinus Carpio), (In French),
W76-08260 5C

Trivalent Chromium in Tannery Effluents,
W76-08295 5D

Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

Electrolytic Purification of Trade Effluents Containing Toxic Materials,
W76-08709 5D

TRACE ELEMENTS
A Study on Marine Trace Elements and CSK Standards, (In Japanese),
W76-08311 2L

TRACERS
Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

TRANSFER OF OPERATIONS
Alternatives for Reducing Water Pollution in Cattlehide Processing and Tanning,
W76-08285 3E

TRANSIENT SNOWLINES
Evaluation of Glacier Mass Balance by Observing Variations in Transient Snowline Positions,
W76-08322 2C

TRANSMISSIVITY
Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case,
W76-08124 2F

TRANSPIRATION
Relation Between Plant Transpiration and Metabolism, (In Russian),
W76-08583 2D

TRANSPORT MECHANISMS
Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

TREATMENT FACILITIES
Duck-Processing Waste,
W76-08168 3E

Treatment of Tannery Wastewater from Bona Allen, Inc., Buford, Georgia,
W76-08177 5D

Water Pollution Control Act of 1972, Institutional Assessment, Construction Grants.
W76-08194 5G

An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

Lake Michigan Gets Help,
W76-08246 5D

Regional Agency Starts up Physical-Chemical Treatment Plant.
W76-08248 5D

New Automation Improves Sacramento Wastewater Control,
W76-08264 5D

Emergency Equipment Utilization Keeps Effluent Clean,
W76-08265 5D

Water Treatment Untouched by Human Hands - Almost,
W76-08266 5F

A Theoretical Study of Factors Influencing the Microbial Population Dynamics of the Activated-Sludge Process-II. A Computer-Simulation Study to Compare Two Methods of Plant Operation,
W76-08277 5D

Morrell Pioneers More Efficient Aeration,
W76-08286 5D

Updating an Existing Pollution Control Facility at Western Electric,
W76-08477 5D

The Electrolytic Processing of Cyanide Wastes,
W76-08706 5D

Municipal Industrial Waste Program Nets $8.9 Million in Two Years.
W76-08712 5D

Industry Takes the Lead in Cleaning Up the Rhine.
W76-08713 5D

Austrian Experiences Concerning Damages of Communal Purification Facilities by Industrial Effluents (Osterreichische Erfahrungen Betreffend Schaden an Kommunalen Klaranlagen Durch Industrieabwasser).
W76-08714 5D

Oxygen, and Other Innovations, Help Lick Tough Waste Problem,
W76-08715 5D

TREES
Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

TRICKLE IRRIGATION
Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

TRINIDAD (CO)
Flood Plain Information: Purgatoire River and Tributaries, Vicinity of Trinidad, Colorado.
W76-08381 4A

TROUT
Some Characteristics of Fat Metabolism in Two Forms of Char Salvelinus Alpinus (L.) From Lake Azabach (Kamchatka), (In Russian),
W76-08310 2H

Rearing the Sevan Trout at the Aigerlich Trout Pond Fishery, (In Armenian),
W76-08371 2I

TRUCKEE RIVER (CALIF)
Transient Water Quality Modeling in Streams,
W76-08730 5B

TUBEWORMS
Sessile Animals on Tar Globules in the Waters Around the Ryukyu Islands, (In Japanese),
W76-08232 2L

TUBIFICIDS
Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

TURBIDITY
Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

TURBULENCE
Dissipation of Turbulent Energy in a Natural Channel,
W76-08744 8B

TURBULENT FLOW
Three-Dimensional Pollutant Modeling in Shear Flow,
W76-08740 5B

TURTLES
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

ULTRAFILTRATION
Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

ULTRASONICS
Ultrasonic River Flow Measurement,
W76-08241 7B

ULTRAVIOLET RADIATION
A Continuous Method of Monitoring Water Quality by Chlorine Consumption Under Ultraviolet Radiation. I. Design and Performance Test of Continuous Chlorine Consumption Meter and Application to Raw Waters of A Water Purification Plant, (In Japanese),
W76-08276 5A

UNDERGROUND CONSTRUCTION
Schriftenreih, (Otto-Graf-Institut), (In German).
W76-08425 8D

UNDERGROUND FILTER BEDS
Hygienic Substantiation of the Possibility of Wastewater Treatment of Poultry Processing Plants on Underground Filter Beds, (In Russian),
W76-08581 5D

UNDERGROUND STRUCTURES
Underground Detention for Storm Overflows.
W76-08234 8G

International Association of Engineering Geology, Proceedings of the Second International Congress, Volume 2.
W76-08418 8E

UNHAIRING LIQUORS
Recycling of Lime-Sulphide Unhairing Liquors - I, Small-Scale Trials,
W76-08179 5D

UNIT TIME DISTRIBUTION
Some Theoretical Considerations in Reservoir Design,
W76-08518 8B

UNSATURATED FLOW
Calculating the Unsaturated Hydraulic Conductivity and Diffusivity,
W76-08142 2G

UNSTEADY FLOW
Transient Free Surface Flow to a Well: An Analysis of Theoretical Solutions,
W76-08333 2F

Transient Aquifer Flows by Characteristics Method,
W76-08513 2F

One-Dimensional Temperature Predictions in Unsteady Flows,
W76-08738 5B

UPWELLING
Surface Circulation Pattern in the Gulf of St. Lawrence,
W76-08126 2L

URANIUM
Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

URBAN DRAINAGE
Development of Storm Drainage Cost Functions,
W76-08227 3D

Urban Hydrology for Small Watersheds.
W76-08509 4D

URBAN HYDROLOGY
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

Urban Hydrology for Small Watersheds.
W76-08509 4D

URBAN RUNOFF
Water Pollution Abatement Technology: Capabilities and Costs, Urban Runoff.
W76-08222 5G

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

Urban Hydrology for Small Watersheds.
W76-08509 4D

URBAN WATERSHEDS
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

URBANIZATION
Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

Hydrology of the Three Sinkhole Basins in Southwestern Seminole County, Florida,
W76-08572 4A

USSR
Role of Far Eastern Herbivorous Fish in Ecosystems of Natural Water Bodies Used for Acclimatization, (In Russian),
W76-08666 5C

USSR (KABARDINO-BALKAR ASSR)
Change of the Content and State of Pigments in Leaves of Male and Female Hemp in Relation to Nutrition and Soil Moisture Content, (In Russian),
W76-08306 2I

USSR (KRASNOYARSKI KRAI)
Snow-Regulating Role of the Forest Belts in the Steppes of the Krasnoyarsk Krai, (In Russian),
W76-08383 2C

USSR (LAKE AZABACH)
Some Characteristics of Fat Metabolism in Two Forms of Char Salvelinus Alpinus (L.) From Lake Azabach (Kamchatka), (In Russian),
W76-08310 2H

USSR (UKRANIAN SSR)
The Effect of Forest Stands on the Water Content of Rocks of the Loess Cover in the Western Regions of the Northern Black Sea Area, (In Ukranian),
W76-08303 4A

USSR (UZBEK-SSR)
Some Problems of the Ecology of the Sary-Chilek Marinka Schizothorax Intermedius Eury-Cephalus Spelter, (In Russian),
W76-08243 2H

VEGETATION
A Model for Estimating Actual Evapotranspiration from Potential Evapotranspiration,
W76-08132 2D

Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

VEGETATION DENSITY
A Model for Estimating Actual Evapotranspiration from Potential Evapotranspiration,
W76-08132 2D

VEGETATION ESTABLISHMENT
Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

VEGETATION MANAGEMENT
Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

VENEZUELA (GULF OF CARIACO)
Ecology of the Zooplankton in the Gulf of Cariaco. Part I: Variability of the Biomass of the Zooplankton During the Period from August to November, 1973, (In Spanish),
W76-08247 5C

VENTURA RIVER (CA)
Flood Plain Information: San Antonio Creek and Tributaries, Vicinity of OJAI, Ventura County, California.
W76-08380 4A

VIRGIN ISLANDS
Chlorinated Hydrocarbon Pesticides and Mercury in Coastal Biota, Puerto Rico and the U.S. Virgin Islands--1972-74,
W76-08683 5B

VIRGINIA BEACH (VA)
Field Performance of Permeable Breakwater,
W76-08684 8A

VITAMIN B
Decontamination of Wastewaters at the Stage of Potassium Arabonate in the Production of Vitamin B2, (In Russian),
W76-08578 5D

VITAMINS
Role of Vitamins in Bacterial-Plankton Relationships in Littoral Seawater and in Supralittoral Pools: II. Annual Evolution of Organisms Which Produce Vitamin Synthesis, (In French),
W76-08405 5C

VOLGA RIVER
Age Composition and Growth of Aspius Aspius (L.) in the Lower Volga, (In Russian),
W76-08255 2I

VORTICELLIDAE
Food Habit of Vorticellidae Isolated From Activated Sludge,
W76-08309 5D

VORTICES
Hydraulic Model Vortex Study-Grand Coulee Third Powerplant,
W76-08113 8B

WALES
The Significance and Variation of Atmospheric Nutrient Inputs in a Small Catchment System,
W76-08728 5A

WALLER COUNTY (TEX)
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

WASHINGTON
Data on Selected Lakes in Washington, Part 3,
W76-08564 2H

Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

Distribution, Composition, and Transport of Suspended Particulate Matter in the Vicinity of Willapa Submarine Canyon, Washington,
W76-08737 2L

WASTE DISPOSAL
Paunch Handling and Processing Techniques,
W76-08173 3E

New Incineration Method Solves Grease Problem in Richmond, Pa.,
W76-08485 5E

Dewatering Vegetable Waste.
W76-08487 5E

Re-Use and Disposal of Waste Acids,
W76-08721 5D

Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

WASTE REDUCTION
Use, Continued Use, and Reuse of Both Process and Waste Waters in Poultry Processing Operations,
W76-08299 3E

Economics of In-Plant Waste Management in Food Processing,
W76-08300 3E

Water and Waste Management in Poultry Processing,
W76-08428 3E

WASTE TREATMENT
Resource Recovery: Possibilities and Pitfalls,
W76-08692 5D

The Effective Management of Waste.
W76-08704 5D

WASTE WATER
Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

WASTE WATER DISPOSAL
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

Kraft Effluent Treatment by Flotation,
W76-08463 5D

Land Treatment of Food Processing Wastewaters,
W76-08468 5E

A Framework for Evaluating Institutional and Socio-Economic Issues of Land Treatment of Waste Water,
W76-08681 5D

WASTE WATER (POLLUTION)
Land-Use Model For Service Area Projection,
W76-08226 5G

WASTE WATER TREATMENT
Environmental Quality and Inflation: A Regional Perspective on the Cost-Push Impact of the 1972 Pure Water Legislation,
W76-08151 5G

Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

Spray Irrigation of Polutry Processing Wastewater,
W76-08165 5D

O2 Injection Doubles/Triples Biological Waste Treatment Activity.
W76-08167 5D

Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

Egg-Processing Plant Wastes,
W76-08170 3E

Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

Protein and Fat Recovery from Effluents,
W76-08172 5D

Report on Methods of Chrome Recovery and Reuse from Spent Chrome Tan Liquor,
W76-08174 5D

Some Aspects of Tannery Effluent Control,
W76-08175 5D

Treatment of Tannery Wastewater from Bona Allen, Inc., Buford, Georgia,
W76-08177 5D

The Role of High Rate Bio-Filters in the Leather Industry,
W76-08180 5D

A Very Rapid Liming and Tanning Process Without Effluent,
W76-08181 3E

Recent Investigations into the Disposal of Tannery Waste Water,
W76-08183 5D

Waste Treatment and Control at Live Oak Poultry Processing Plant,
W76-08185 3E

Water Pollution Abatement Technology, Capabilities and Costs, Textile Industry.
W76-08186 5G

Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

Capabilities and Costs of Technology for the Organic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08188 5G

Capabilities and Costs of Technology for the Inorganic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08189 5G

Water Pollution Abatement Technology: Costs and Capabilities Petroleum Refining Industry, Part 1, Chapters -V.
W76-08190 5G

Water Pollution Abatement Technology: Costs and Capabilities, Petroleum Refining Industry, Part 2, Chapters VI - IX.
W76-08191 5G

An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

Sterilization of Holding Tanks and Toilet Bowls by Quaternary Compounds,
W76-08201 5D

Apparatus for Continuous Dewatering of Aqueous Suspensions,
W76-08202 5D

Liquid Conditioning and Settling Tanks,
W76-08203 5D

Purification of Effluent,
W76-08206 5D

Decolorizing Method for Waste Kraft Paper Mill Effluents,
W76-08207 5D

Process for the Environmentally Favorable Destruction of Solid and/or Liquid Cyanide Waste,
W76-08208 5D

Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

Innovative Technologies for Water Pollution (Abatement).
W76-08220 5G

Acid Coagulation and Dissolved Air Flotation,
W76-08224 5D

Use of Crushed Limestone to Neutralize Acid Wastes,
W76-08225 5G

Combination Sewage Treatment and Cooling System,
W76-08242 5D

Lake Michigan Gets Help,
W76-08246 5D

Regional Agency Starts up Physical-Chemical Treatment Plant.
W76-08248 5D

Economical Foam Control in Wastewater Treatment Systems,
W76-08249 5D

Apparatus for Flushing Sewers,
W76-08262 5D

Sewage Cleaned with Coal,
W76-08263 5D

New Automation Improves Sacramento Wastewater Control,
W76-08264 5D

Emergency Equipment Utilization Keeps Effluent Clean,
W76-08265 5D

Zero Effluent System.
W76-08267 5D

Efficient Chemical Method for the Treatment of Zinc Manufacturing Plant Generated Waste Waters (Effektivnyy khimicheskikh sposob ochistki stochnykh vod tsinkovogo zavoda),
W76-08268 5D

Waste Water Recycled For Use in Refinery Cooling Towers,
W76-08270 5D

Cyanide Treatment in the Metal Finishing Industry,
W76-08271 5D

Canadian Milling Practice for Water Re-Use,
W76-08272 5D

A New Sewage Treatment Technique for the Purpose of Nitrogen Elimination (I): Biological Denitrogenization of Urban Sewage (Chisso jokyo o mokuteki to shite atarashii gesui shori gijutsu (I),--Toshi gesui kara no seibutsugakuteki datsu chissoho ni tsuite),
W76-08274 5D

A Theoretical Study of Factors Influencing the Microbial Population Dynamics of the Activated-Sludge Process-II. A Computer-Simulation Study to Compare Two Methods of Plant Operation,
W76-08277 5D

Morrell Pioneers More Efficient Aeration,
W76-08286 5D

The Influence of Soils and Plant Cover on the Retention and Utilization of Suspended and Dissolved Materials in the Waste Water of a Poultry Processing Plant,
W76-08287 5D

New Approaches Point to Better Economies in Hide Processing,
W76-08288 3E

Wastewater Control at Egg Products Plants, Pt. 1-3.
W76-08291 3E

Wastes from the Poultry Processing Industry,
W76-08292 3E

Design and Performance of Physical-Chemical and Activated Sludge Treatment for an Edible Oil Plant,
W76-08293 5D

Combined Treatment of Leather Tanning and Municipal Wastes at Grand Haven, Michigan,
W76-08294 5D

Trivalent Chromium in Tannery Effluents,
W76-08295 5D

Changing Hog Hair from Costly Nuisance to Asset.
W76-08297 5D

Use, Continued Use, and Reuse of Both Process and Waste Waters in Poultry Processing Operations,
W76-08299 3E

Economics of In-Plant Waste Management in Food Processing,
W76-08300 3E

Demand Bactericide for Disinfecting Water and Process of Preparation,
W76-08391 5D

Process for Purification of Industrial Waste Waters from Perchlorates and Chlorates,
W76-08395 5D

Catalytic Filtering-Incinerating Process and Device for Waste Water,
W76-08400 5D

Removing Heavy Metal Ions from Water,
W76-08401 5D

Removal of Heavy Metal Ions from Wastewater,
W76-08402 5D

Method and Apparatus for Drying Moisture-Containing Solids, Particularly Domestic Refuse and Sludge Cakes,
W76-08404 5D

Process and Apparatus for Recovering Clean Water From Aqueous Wastes,
W76-08408 5D

Process of Preparing Sewage Sludge for Dewatering,
W76-08409 5D

Water and Waste Management in Poultry Processing,
W76-08428 3E

The Control of Chloride Ions in the MgO Recovery System,
W76-08457 5D

Toxic Constituents in Pulp Mill Effluents,
W76-08458 5A

Method and Apparatus for the Destructive Decomposition of Organic Wastes Without Air Pollution and With Recovery of Chemical Byproducts,
W76-08459 5D

Foam Detoxification of Bleached Kraft Effluent,
W76-08460 5D

Detoxification of Bleached Kraft Mill Effluents,
W76-08461 5D

Paper Pulp Effluent Purification.
W76-08462 5D

Kraft Effluent Treatment by Flotation,
W76-08463 5D

The Effects of High Sodium Chloride Concentrations and High Pollutant Loads on the Composition of the Activated Sludge Microflora in the Treatment of Petroleum Refinery-Generated Effluents (Wplyw wysokiego Stezenia Chlorku Sodowego I Duzego Ladunku Zanieczyszczen Na Sklad Milroflory Osadu Czynnego Przy Oczyszczaniu Sciekow Rafineryjno-Petrochemicznych).
W76-08464 5D

Effluent Treatment in Selected Organic Chemical Factories,
W76-08465 5D

Staffliners Prevent Contaminants from Polluting Ground Water at Industrial Waste Treatment Center.
W76-08466 5D

Recovery and Separation of Chemicals Produced During Kraft Pulping Operations,
W76-08467 5D

Land Treatment of Food Processing Wastewaters,
W76-08468 5E

Rum Distillery Wastes: Laboratory Studies on Aerobic Treatment,
W76-08469 5D

A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

Process for the Electrolytic Reclamation of Spent Etching Fluids,
W76-08471 5D

Treatment of Photographic Ferrocyanide-Type Bleach Solutions for Reuse and Disposal,
W76-08472 5D

Industrial Effluent Treatment,
W76-08473 5D

Crude Soap Recovers Mercury from Water,
W76-08474 5D

Treatment Method for Oil-Containing Liquid Waste (Ganyu haisui shoriho),
W76-08475 5D

Elimination Method for Mercury Residue in Water (Suichu yozon suigin no jokyoho),
W76-08476 5D

Updating an Existing Pollution Control Facility at Western Electric,
W76-08477 5D

Plating Waste Recovery Unit,
W76-08478 5D

Pickling with Hydrogen Peroxide Solutions,
W76-08479 5D

Water Treatment System Saves 45,000 Gals Daily.
W76-08480 5D

Cooperation Helps Erie,
W76-08481 5D

Process for Treating Water-Soluble Organic Wastes,
W76-08482 5D

Pollution Problem Solver,
W76-08483 5D

Removal of Oil Pollution.
W76-08484 5D

New Incineration Method Solves Grease Problem in Richmond, Pa.,
W76-08485 5E

Reverse Osmosis System Corrects High BOD Wastes: Yields Net Operating Savings,
W76-08486 5D

Treatment of Effluent.
W76-08488 5D

Fiber Recovery Increases Water Re Use, Reduces Treatment Cost,
W76-08489 5D

Heavy Metal Salts Recovery.
W76-08490 5D

Ims-Grangcold Pelletizing System for Steel Mill Wastes Material,
W76-08491 5D

Treating Waste Liquors Containing Metal-Working Oil Emulsions.
W76-08492 5D

Metallic Recovery System,
W76-08493 5D

Effluent Water Treatment.
W76-08494 5D

Settling Tank,
W76-08495 5D

Sour Water Treatment Process.
W76-08496 5D

Removing Fine Plastic Particles From Waste Water.
W76-08497 5D

Slurry-Burning Process.
W76-08498 5D

Determination of Traces of Carbon in Solid and Liquid Wastes of Chemical Plants by Means of Thermal Conductivity Measurements (Bestimmung Von Spuren Kohlenstoff in Festen Und Fluessigen Abfallstoffen Der Chemischen Industrie Mit Hilfe Der Waermeleitfaehigkeitsmessung),
W76-08499 5A

Rapson Idea Set for Mill Trials.
W76-08500 5D

Determining Oil Content, in Water.
W76-08501 5A

Libby, McNeill Solves an Odor Problem,
W76-08502 5D

Animal Food.
W76-08503 5D

Dry Caustic Peeling of Beets and Carrots Reduces Pollution,
W76-08504 5D

Purification of Waste Water.
W76-08505 5D

Sulphuric Acid Containing Rinses, Purification,
W76-08506 5D

Phytoplankton in Northern Donetsk Ponds for Additional Treatment, (In Ukranian),
W76-08577 5C

Decontamination of Wastewaters at the Stage of Potassium Arabonate in the Production of Vitamin B2, (In Russian),
W76-08578 5D

Study of the Effectiveness of Removing Heavy Metals in Biological Purification of Municipal Sewage, (In Russian),
W76-08580 5D

Hygienic Substantiation of the Possibility of Wastewater Treatment of Poultry Processing Plants on Underground Filter Beds, (In Russian),
W76-08581 5D

Phosphorus Movement in Soils: Soil-Orthophosphate Reaction Kinetics,
W76-08672 5B

A Framework for Evaluating Institutional and Socio-Economic Issues of Land Treatment of Waste Water,
W76-08681 5D

Paper Making Waste-Water Purification.
W76-08695 5D

Pressurized Oxidation of Pulp Spent Liquor (Parupu haieki no kaatsu snaka),
W76-08696 5D

The Long Hard Road to the Effluent-Free Pulp Mill,
W76-08698 5D

Biological Processes for Effluent and Waste Treatment Exemplified by the Paper Industry (Biologische Verfahren Zur Abwasser- Und Abfallaufbereitung am Beispiel der Paper-Industrie),
W76-08699 5D

The Effluent Treatment System and Utilization of Recycled Water in the Iyomishima Mill (Daio seishi Mishima kojo ni okeru sogo haisui shori to haisui no sairiyo),
W76-08700 5D

Chemical Clarification of Waste Water.
W76-08702 5D

Fluoride Removal: Technology and Cost Estimates,
W76-08703 5D

The Effective Management of Waste.
W76-08704 5D

Purifying-Demicrobising Waste-Water.
W76-08705 5D

The Electrolytic Processing of Cyanide Wastes,
W76-08706 5D

Studies Concerning Oil Removal from Mill Scale (Untersuchungen Zur Entoelung Von Walzzunder),
W76-08707 5D

Clearing of Titanium- and Aluminium-Containing Effluent Waters.
W76-08708 5D

Electrolytic Purification of Trade Effluents Containing Toxic Materials,
W76-08709 5D

High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

Industrial Waste Treatment System Reduces Pollution,
W76-08711 5D

Municipal Industrial Waste Program Nets $8.9 Million in Two Years.
W76-08712 5D

Industry Takes the Lead in Cleaning Up the Rhine.
W76-08713 5D

Austrian Experiences Concerning Damages of Communal Purification Facilities by Industrial Effluents (Osterreichische Erfahrungen Betreffend Schaden an Kommunalen Klaranlagen Durch Industrieabwasser).
W76-08714 5D

Treatment of Dye Wastes with Granular Activated Carbon,
W76-08716 5D

A Modified Raw-Wool Scouring System for Easier Effluent Treatment,
W76-08717 5D

Cleaning of Industrial Effluent,
W76-08719 5D

Canton's Futuristic Waste Treatment System,
W76-08720 5D

WATER ALLOCATION (POLICY)
Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality,
W76-08152 6B

Water Allocation.
W76-08154 6B

Economic Evaluation of Proposed Water Conservation Practices on Established Irrigation Districts: A General Methodology and Application to Three Districts in Oregon,
W76-08431 3F

WATER ANALYSIS
Determination of Total Nitrogen in Natural Waters,
W76-08355 2K

Reassessment of Mercury in Surface Water in the Adirondack Region, New York,
W76-08554 2K

Amino Acids and Gases in Some Springs and an Oil Field in California,
W76-08568 4B

WATER BALANCE
The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

WATER BUDGET METHOD
Water Use by Saltcedar as Measured by the Water Budget Method,
W76-08573 2D

WATER CHEMISTRY
Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

WATER CIRCULATION
A Seabed Drifter Study of Near-Bottom Circulation in North Carolina Shelf Waters,
W76-08350 2L

Measurements of Current Flow During Summer in Lake Huron,
W76-08413 2H

Oceanographic Conditions During 1973 in Russel Fjord, Alaska,
W76-08525 2L

Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

Continuous Dynamical Computations of Water Transports in Lake Erie for 1970,
W76-08724 2H

WATER CONSERVATION
Residential Water Conservation,
W76-08103 3D

Economic Evaluation of Proposed Water Conservation Practices on Established Irrigation Districts: A General Methodology and Application to Three Districts in Oregon,
W76-08431 3F

WATER CONSUMPTION
Residential Water Conservation,
W76-08103 3D

Recent Investigations into the Disposal of Tannery Waste Water,
W76-08183 5D

Recycling of Water in Poultry Processing Plants,
W76-08298 3E

WATER LEVELS
Design of Ground-Water Level Observation Network.
W76-08563 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

WATER LOSS
Water Use by Saltcedar as Measured by the Water Budget Method,
W76-08573 2D

WATER MANAGEMENT (APPLIED)
Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

WATER POLLUTION
Land Use and Water Quality in New York Rivers,
W76-08133 5B

Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

Updating the Navy Environmental Protection Data Base to Incorporate Oil Spill Clean-Up Performance,
W76-08320 5B

Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

Savannah River Laboratory Environmental Transport and Effects Research Annual Report - 1974.
W76-08596 5B

Radioruthenium in Coastal Waters,
W76-08619 5A

WATER POLLUTION CONTROL
Environmental Quality and Inflation: A Regional Perspective on the Cost-Push Impact of the 1972 Pure Water Legislation,
W76-08151 5G

Capabilities and Costs of Technology for the Organic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08188 5G

Capabilities and Costs of Technology for the Inorganic Chemicals Industry to Achieve the Effluent Limitations of P. L. 92-500.
W76-08189 5G

Water Pollution Abatement Technology: Costs and Capabilities Petroleum Refining Industry, Part 1, Chapters -V.
W76-08190 5G

Water Pollution Abatement Technology: Costs and Capabilities, Petroleum Refining Industry, Part 2, Chapters VI - IX.
W76-08191 5G

Cleaning of Cargo Compartments,
W76-08198 5G

Lake Michigan Gets Help,
W76-08246 5D

The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

Preparation of Plans and Specifications for Pollution Abatement Activities in Cherry Creek Watershed, Maryland.
W76-08385 5G

Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

Floating Oil Barrier,
W76-08396 5G

Apparatus for Pumping Oil-Water Mixture from a Collection Vessel of a Floating Oil Collector into Settling Tanks,
W76-08403 5G

Removal of Oil Pollution.
W76-08484 5D

WATER POLLUTION CONTROL TECHNOLOGY

Water Pollution Abatement Technology, Capabilities and Costs, Textile Industry.
W76-08186 5G

Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

WATER POLLUTION EFFECTS

Decolorizing Method for Waste Kraft Paper Mill Effluents,
W76-08207 5D

Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

WATER POLLUTION SOURCES

Ground Water Flow No Longer a Mystery,
W76-08114 2F

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

Distribution and Movement of Zinc and Other Heavy Metals in South San Francisco Bay, California,
W76-08561 5B

Three-Dimensional Pollutant Modeling in Shear Flow,
W76-08740 5B

WATER POLLUTION TREATMENT

Solid Mineral and Regenerant Recovery for Ion-Exchange Resins,
W76-08199 3A

Sterilization of Holding Tanks and Toilet Bowls by Quaternary Compounds,
W76-08201 5D

Apparatus for Continuous Dewatering of Aqueous Suspensions,
W76-08202 5D

Liquid Conditioning and Settling Tanks,
W76-08203 5D

Purification of Effluent,
W76-08206 5D

Decolorizing Method for Waste Kraft Paper Mill Effluents,
W76-08207 5D

Process for the Environmentally Favorable Destruction of Solid and/or Liquid Cyanide Waste,
W76-08208 5D

Coanda Effect Oil-Water Separator,
W76-08209 5G

Water Filter Assembly,
W76-08392 8C

Catalytic Filtering-Incinerating Process and Device for Waste Water,
W76-08400 5D

Removing Heavy Metal Ions from Water,
W76-08401 5D

WATER PRESSURE

On the Occurrence of Pressure Water in Low Bogs, (In German),
W76-08105 2H

WATER PURIFICATION

Zero Energy Input Flocculator,
W76-08200 5F

Purification of Effluent,
W76-08206 5D

Coanda Effect Oil-Water Separator,
W76-08209 5G

Modular Water Filter,
W76-08210 5F

Water Quality Criteria for Great Lakes Waters to be Used as Municipal and Industrial Water Supplies,
W76-08363 5D

Demand Bactericide for Disinfecting Water and Process of Preparation,
W76-08391 5D

Removing Heavy Metal Ions from Water,
W76-08401 5D

Process and Apparatus for Recovering Clean Water From Aqueous Wastes,
W76-08408 5D

WATER QUALITY

An Optimization Model for Regional Water Quality Management,
W76-08104 5G

Land Use and Water Quality in New York Rivers,
W76-08133 5B

Shooting Models for Salinity and Coliform,
W76-08134 5B

Two-Dimensional Mathematical Water Quality Model,
W76-08135 5B

Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality,
W76-08152 6B

Water Quality.
W76-08155 5G

Absorptiometric Determination of Iron with T.P.T.Z.,
W76-08273 5A

A Continuous Method of Monitoring Water Quality by Chlorine Consumption Under Ultraviolet Radiation. I. Design and Performance Test of Continuous Chlorine Consumption Meter and Application to Raw Waters of A Water Purification Plant, (In Japanese),
W76-08276 5A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

The Relationship Between Watershed Use and Stream Water Quality,
W76-08282 4D

A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

Coralville Water Quality Study, Annual Report, Water Year October 1, 1974 to September 30, 1975,
W76-08324 5A

Water Resources Planning for Rivers Draining into Mobile Bay, Part II: Non-Conservative Species Transport Models,
W76-08327 5B

The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

Transfer of Boron and Tritiated Water Through Sandstone,
W76-08547 5B

Geology and Water Resources of Marshall County, South Dakota--Part 1: Geology and Water Resources,
W76-08558 4A

Water Quality in the Mad River Basin, Humboldt and Trinity Counties, California,
W76-08562 5A

Data on Selected Lakes in Washington, Part 3,
W76-08564 2H

Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

WATER QUALITY

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

Effects of Forest Fertilization on Two Southeast Alaska Streams,
W76-08673 5B

Water Quality in Irrigated Watersheds,
W76-08679 5B

Lake Erie and Its Basin,
W76-08723 2H

The Significance and Variation of Atmospheric Nutrient Inputs in a Small Catchment System,
W76-08728 5A

Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

WATER QUALITY CONTROL

Cleaning of Cargo Compartments,
W76-08198 5G

Coanda Effect Oil-Water Separator,
W76-08209 5G

Water Filter Assembly,
W76-08392 8C

Floating Oil Barrier,
W76-08396 5G

Apparatus for Pumping Oil-Water Mixture from a Collection Vessel of a Floating Oil Collector into Settling Tanks,
W76-08403 5G

Transient Water Quality Modeling in Streams,
W76-08730 5B

WATER QUALITY MODEL

Two-Dimensional Mathematical Water Quality Model,
W76-08135 5B

WATER QUALITY STANDARDS

Water Quality Criteria for Great Lakes Waters to be Used as Municipal and Industrial Water Supplies,
W76-08363 5D

WATER REQUIREMENTS

Dependence of Stomatal Number and Size in Juglans Regia L. on Ecological Conditions, (In Bulgarian),
W76-08668 2I

WATER RESOURCES

Water Resources of the World, Selected Statistics.
W76-08507 7C

The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

Water Resources Data for California, 1974: Part 1. Surface Water Records--Volume 2: Northern Great Basin and Central Valley.
W76-08556 7C

Geology and Water Resources of Marshall County, South Dakota--Part 1: Geology and Water Resources,
W76-08558 4A

WATER RESOURCES RESEARCH ACT

Annual Report, Water Resources Research Activities under Public Law 88-379, Fiscal Year 1975.
W76-08163 9D

WATER RESOURCES USERS

Impact of Remote Sensing Upon the Planning, Management, and Development, and Development of Water Resources,
W76-08536 6B

WATER REUSE

Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

Report on Methods of Chrome Recovery and Reuse from Spent Chrome Tan Liquor,
W76-08174 5D

Waste Water Recycled For Use in Refinery Cooling Towers,
W76-08270 5D

Canadian Milling Practice for Water Re-Use,
W76-08272 5D

Use, Continued Use, and Reuse of Both Process and Waste Waters in Poultry Processing Operations,
W76-08299 3E

Economics of In-Plant Waste Management in Food Processing,
W76-08300 3E

Land Treatment of Food Processing Wastewaters,
W76-08468 5E

Treatment of Photographic Ferrocyanide-Type Bleach Solutions for Reuse and Disposal,
W76-08472 5D

Water Treatment System Saves 45,000 Gals Daily.
W76-08480 5D

Pollution Problem Solver,
W76-08483 5D

Fiber Recovery Increases Water Re-Use, Reduces Treatment Cost,
W76-08489 5D

Sour Water Treatment Process.
W76-08496 5D

Recycling--Examples for Its Possibilities and Limits (Recycling--Beispiele fuer Moeglichkeiten und Grenzen),
W76-08701 5D

WATER SAMPLING

Evaluation of Methods for Preserving the Levels of Soluble Inorganic Phosphorus and Nitrogen in Unfiltered Water Samples,
W76-08157 5A

WATER SPREADING

Artificial-Recharge Experiments in the Alluvial Aquifer South of Fountain, El Paso County, Colorado,
W76-08571 4B

WATER SUPPLY

Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality,
W76-08152 6B

Water Supply.
W76-08153 4A

Land-Use Model For Service Area Projection,
W76-08226 5G

The Water Supply System of a Large Urban Agglomeration in Switzerland (Die Wasserversowgung Einer Schweizerischen Gross-Agglomeration),
W76-08233 5F

The Effect of Forest Stands on the Water Content of Rocks of the Loess Cover in the Western Regions of the Northern Black Sea Area, (In Ukranian),
W76-08303 4A

Water Resources of the World, Selected Statistics.
W76-08507 7C

WATER TABLE

Ground Water Flow No Longer a Mystery,
W76-08114 2F

WATER TABLE AQUIFERS

Transient Free Surface Flow to a Well: An Analysis of Theoretical Solutions,
W76-08333 2F

WATER TEMPERATURE

On a Thermal Lag in the North Atlantic Ocean During a Climatic Change,
W76-08127 2L

Lake Huron Surface Water Temperature, May-November, 1966,
W76-08141 2H

Water Temperature Variations Within a Major River System,
W76-08340 2E

WATER TREATMENT

Water Quality.
W76-08155 5G

Zero Energy Input Flocculator,
W76-08200 5F

Coanda Effect Oil-Water Separator,
W76-08209 5G

Modular Water Filter,
W76-08210 5F

Water Treatment Untouched by Human Hands - Almost,
W76-08266 5F

Demand Bactericide for Disinfecting Water and Process of Preparation,
W76-08391 5D

Water Filter Assembly,
W76-08392 8C

Drinking Water Purification in Industrially Manufactured Compact Installations of the Type 'Struya', (In English),
W76-08579 5F

WATER UPTAKE
Relation Between Plant Transpiration and Metabolism, (In Russian),
W76-08583 2D

WATER UTILIZATION
Moisturizing Apparatus for Use with Wind Machines,
W76-08399 3F

Water Use by Saltcedar as Measured by the Water Budget Method,
W76-08573 2D

WATER WELLS
Radioruthenium in Coastal Waters,
W76-08619 5A

WATER YIELD
Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

First-Year Water Yield Increase After Forest Cutting: An Alternative Model,
W76-08362 4C

Water Resources Data for California, 1974: Part 1. Surface Water Records--Volume 2: Northern Great Basin and Central Valley.
W76-08556 7C

WATER YIELD IMPROVEMENT
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

Pinyon-Juniper Control--Does it Pay,
W76-08110 4A

Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

WATERFRONT DEVELOPMENT
The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

WATERGRATE INCINERATOR
New Incineration Method Solves Grease Problem in Richmond, Pa.,
W76-08485 5E

WATERPROOFING
Evaluation of Bentonite Clay for Waterproofing Foundation Walls Below Grade,
W76-08427 8D

WATERSHED MANAGEMENT
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

Urban Hydrology for Small Watersheds.
W76-08509 4D

WATERSHED MODELS
Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

WATERSHEDS (BASINS)
Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

The Relationship Between Watershed Use and Stream Water Quality,
W76-08282 4D

A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

First-Year Water Yield Increase After Forest Cutting: An Alternative Model,
W76-08362 4C

Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

WAVE SPECTRA
A Parametric Wave Prediction Model,
W76-08337 2L

WAVE SUPPRESSION
Suppression of Waves in Slotted-Walled Channel,
W76-08742 8B

WAVES (WATER)
The Theory and Applications of Ocean Wave Measuring Systems at and Below the Sea Surface, on the Land, from Aircraft, and from Spacecraft,
W76-08145 7B

A Parametric Wave Prediction Model,
W76-08337 2L

Numerical Computation of Two-Dimensional Flows,
W76-08341 2L

WEATHER
Particle Vaporizer,
W76-08148 3B

WEATHER MODIFICATION
Particle Vaporizer,
W76-08148 3B

Design of an Experiment to Suppress Hail in Illinois,
W76-08330 3B

WEATHERING
Behaviour of Oil Under Canadian Climatic Conditions. Part 1. Oil on Water Under Ice-Forming Conditions,
W76-08365 5B

WEIBULL DISTRIBUTION
Reassessment of the Cross-Florida Barge Canal: A Probability Approach,
W76-08228 4A

WELL DATA
Selected Hydrologic Data, Chester County, Pennsylvania,
W76-08557 7C

WELL-MIXED ESTUARIES
Computation of Tidal Flow in Well-Mixed Estuaries,
W76-08741 2L

WELL RESPONSE TEST
Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case,
W76-08124 2F

WELLS
Ground Water Flow No Longer a Mystery,
W76-08114 2F

WESTERNPORT BAY (AUSTRALIA)
Two-Dimensional Mathematical Water Quality Model,
W76-08135 5B

WETLANDS
ERTS-1 Investigation of Wetlands Ecology,
W76-08319 2L

WHEAT
A Comparative Study of the Effect of Qualities of Irrigation Water on Different Soils,
W76-08301 3C

Carbohydrate Transformation in Wheat and Rye Plants Under Effect of Flooding in the Autumn-Winter Period, (In Russian),
W76-08307 3F

Limited Irrigation of Grain Sorghum in Alternating Strips with Wheat,
W76-08542 3F

WHITE SHRIMP
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

WIDTH-DISCHARGE RELATIONS
Complex Width-Discharge Relations in Natural River Sections,
W76-08735 2E

WILLAPA CANYON (WASH)
Distribution, Composition, and Transport of Suspended Particulate Matter in the Vicinity of Willapa Submarine Canyon, Washington,
W76-08737 2L

WINTER FLOUNDER
Effects of Temperature and Salinity on the Survival of Winter Flounder Embryos,
W76-08437 5C

WITHDRAWAL
Estimation by Digital Computer of the Drawdown Caused by Groundwater Withdrawal,
W76-08140 4B

WORLD-WIDE STATISTICS
Water Resources of the World, Selected Statistics.
W76-08507 7C

WYOMING
Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

X-RAY DIFFRACTION
Soil Stabilization with Powdered and Coarse Quicklime,
W76-08422 8D

XANTHATES
The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

YEASTS
Role of Vitamins in Bacterial-Plankton Relationships in Littoral Seawater and in Supralittoral Pools: II. Annual Evolution of Organisms Which Produce Vitamin Synthesis, (In French),
W76-08405 5C

YIELD CHANGES
Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

ZINC
Efficient Chemical Method for the Treatment of Zinc Manufacturing Plant Generated Waste Waters (Effektivnyy khimicheskikh sposob ochistki stochnykh vod tsinkovogo zavoda),
W76-08268 5D

A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

ZIRCONIUM
A Review of Methods for the Determination of Radioactive and Stable Zirconium in the Marine Environment,
W76-08620 5A

A Study of the Stability of Some Radionuclides in Seawater,
W76-08625 5A

ZONING
Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

ZOOPLANKTON
Marine Ecology of the Northern Euboea: I. Preliminary Data on the Zooplankton and the Ichtyoplankton, (In French),
W76-08106 2L

Distribution of Chaetognatha and Biomass of the Zooplankton in the Western Part of the Tropical Atlantic, During July and August 1968, (In Spanish),
W76-08245 2L

Ecology of the Zooplankton in the Gulf of Cariaco. Part I: Variability of the Biomass of the Zooplankton During the Period from August to November, 1973, (In Spanish),
W76-08247 5C

Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

Zooplankton Survival in Cooling Water Systems of Four Thermal Power Plants on the California Coast-Interim Report. March 1971-January 1972,
W76-08630 5C

Entrainment of Zooplankton at Three Mid-Atlantic Power Plants,
W76-08639 5C

Zooplankton Studies at Morgantown,
W76-08640 5C

AUTHOR INDEX

AARKROG, A.
Radiochemical Determination of Plutonium in Marine Samples by Ion Exchange and Solvent Extraction,
W76-08614 5A

ABBI, S. D. S.
Extreme Rainfall Studies of the Brahmani, The Burhabalang, The Rushikulya and the Subarnarekha River Catchments,
W76-08733 2B

Rainfall and Floods in India During 1974 Southwest Monsoon Period,
W76-08732 2B

ABDRASHITOVA, S. A.
Abundance and Biomass of Bacterioplankton of 'Tastaka' Ponds, (In Russian),
W76-08664 5C

ABOOD, K. A.
Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

ABUKISHK, B. A.
Efficient Resource Utilization Within a Regional Framework.
W76-08102 6B

ADAMS, C. E.
Design and Performance of Physical-Chemical and Activated Sludge Treatment for an Edible Oil Plant,
W76-08293 5D

ADAMS, J. R.
Zooplankton Survival in Cooling Water Systems of Four Thermal Power Plants on the California Coast-Interim Report. March 1971-January 1972,
W76-08630 5C

ADMINIS, U.
Recycling of Lime-Sulphide Unhairing Liquors - I, Small-Scale Trials,
W76-08179 5D

ADRIANO, D. C.
Phosphorus Movement in Soils: Soil-Orthophosphate Reaction Kinetics,
W76-08672 5B

AHRENS, G. E.
Morrell Pioneers More Efficient Aeration,
W76-08286 5D

AIBA, S.
Food Habit of Vorticellidae Isolated From Activated Sludge,
W76-08309 5D

AKELEY, R.
Environmental Monitoring from Spacecraft Data,
W76-08532 5A

AKERS, J. M.
Utilisation of Blood,
W76-08166 3E

ALBERTS, J. J.
Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

ALEKSEEVA, R. K.
Sulphuric Acid Containing Rinses, Purification,
W76-08506 5D

ALEVRAS, R. A.
Status of Air Bubble Fish Protection System at Indian Point Station on the Hudson River,
W76-08657 8I

ALEXANDER, V.
The Nitrogen Balance of Arctic Tundra: Pathways, Rates, and Environmental Implications,
W76-08678 5B

ALIEV, D. D.
Role of Far Eastern Herbivorous Fish in Ecosystems of Natural Water Bodies Used for Acclimatization, (In Russian),
W76-08666 5C

ALIFANOVA, T. I.
Snow-Regulating Role of the Forest Belts in the Steppes of the Krasnoyarsk Krai, (In Russian),
W76-08383 2C

ALLANACH, W. C. JR.
Soil Stabilization with Powdered and Coarse Quicklime,
W76-08422 8D

ALLEN, J. S.
Some Three-Dimensional Characteristics of Low-Frequency Current Fluctuations Near the Oregon Coast,
W76-08336 2L

AMINUL, A. K. M.
An Experiment on the Feeding of Fry of Catfish Heteropneustes Fossilis,
W76-08575 2I

ANDERSEN, J. M.
An Ignition Method for Determination of Total Phosphorus in Lake Sediments,
W76-08346 5A

ANDERSON, C. A.
A Modified Raw-Wool Scouring System for Easier Effluent Treatment,
W76-08717 5D

ANDERSON, D. M.
Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

ANDERSON, D. R.
Transient Water Quality Modeling in Streams,
W76-08730 5B

ANDERSON, R. R.
ERTS-1 Investigation of Wetlands Ecology,
W76-08319 2L

ANDERSON, S. J.
Summary of Entrainment Research at the Millstone Point Nuclear Power Station, 1970 to 1972,
W76-08632 5C

ANDERSON, W.
Hydrology of the Three Sinkhole Basins in Southwestern Seminole County, Florida,
W76-08572 4A

ANDERSON, W. M.
Metallic Recovery System,
W76-08493 5D

ANISIMOV, A. V.
Study of Self-Diffusion of Water and its Activation Energy in Cells of Different Plant Tissues, (In Russian),
W76-08429 2I

ANTONACOPOULOS, N.
The Influence of Water Quality on Accumulation of Heavy Metals in Aquatic Organisms,
W76-08456 5C

ANTONELLI, J.
Updating the Navy Environmental Protection Data Base to Incorporate Oil Spill Clean-Up Performance,
W76-08320 5B

APRIL, G. C.
Water Resources Planning for Rivers Draining into Mobile Bay, Part II: Non-Conservative Species Transport Models,
W76-08327 5B

ARAOKA, T.
Fan Disturbing Sand at the Bottom of a Body of Water so That it May be Pumped up Efficiently,
W76-08205 8C

ARDAKANI, M. S.
Nitrate Reduction and Associated Microbial Populations in a Ponded Hanford Sandy Loam,
W76-08546 5G

ARNOLD, D. J.
A Simple Continuous-Flow Respirometer for Comparative Respiratory Changes in Medium-Sized Aquatic Organisms,
W76-08353 5C

ARONSON, A. K.
Note on the Distribution of Mercury in Fish Species in Three Ohio Lakes,
W76-08441 5C

ARONSON, J. L.
Note on the Distribution of Mercury in Fish Species in Three Ohio Lakes,
W76-08441 5C

ARULANANDAN, K.
Fundamental Aspects of Erosion of Cohesive Soils,
W76-08540 2J

ASHTON, G. D.
Arching of Fragmented Ice Covers,
W76-08149 2C

ASKEROV, T. A.
Survival Rate of Starving Carp (Cyprinus Carpio Linne), (In Russian),
W76-08552 5C

ASLYNG, H. C.
Effect of Solar Energy and Water on Plant Productivity (In Bulgarian),
W76-08576 2I

BABU, D. K.
Infiltration Analysis and Perturbation Methods 1. Absorption with Exponential Diffusivity,
W76-08334 2G

BABU RAO, T.
How Much Precipitation Goes to Infiltration During a Storm Period,
W76-08339 2A

BAER, J.
Rain Gauge,
W76-08397 2B

BAIERL, K. W.
Recovery and Separation of Chemicals Produced During Kraft Pulping Operations,
W76-08467 5D

BAILEY, B. H.
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

BAILEY, D. A.
The Role of High Rate Bio-Filters in the Leather Industry,
W76-08180 5D

BAIRD, F. L.
Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

BAIRD, R. C.
Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

BAKER, E. T.
Distribution, Composition, and Transport of Suspended Particulate Matter in the Vicinity of Willapa Submarine Canyon, Washington,
W76-08737 2L

BAKER, M. B. JR.
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

Multiple Use Evaluations on Ponderosa Pine Forest Land,
W76-08109 4A

BALLESTRA, S.
Intercalibration of Methods for Radionuclide Measurements on a Seaweed Sample,
W76-08626 5A

BANKS, R. B.
Distributions of BOD and Do In Rivers and Lakes,
W76-08743 5B

BARADAS, M. W.
Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

Resistance-Mass Transfer Method for Estimating Evapotranspiration: Comparison with Lysimetric Measurements in Irrigated Sorghum,
W76-08588 2D

BARBANTI, L.
An Ecologic Survey of Lake Endine, (In Italian),
W76-08244 5C

BARROIS, J. M.
Marine Ecology of the Northern Euboea: I. Preliminary Data on the Zooplankton and the Ichtyoplankton, (In French),
W76-08106 2L

BARSDATE, R. J.
The Nitrogen Balance of Arctic Tundra: Pathways, Rates, and Environmental Implications,
W76-08678 5B

BARTOLOTTA, R. J.
Resource Recovery: Possibilities and Pitfalls,
W76-08692 5D

BARTSCH-WINKLER, S. R.
The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

BATCHELDER, A. R.
Eutrophication of Microponds,
W76-08354 5C

BATH, D. W.
Entrainment Studies on Hudson River Organisms,
W76-08633 5C

BAUBINAS, A. K.
Bacterial Contamination of Perennial Grasses in Overhead Irrigation with Sewage, (In Russian),
W76-08582 5D

BEAL, R. E.
Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

BECKMAN, J. E.
Development of Assymmetric Cellulose Triacetate Membranes for Seawater Desalination,
W76-08283 3A

BELAIRE, C. E.
Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

BELL, D. E.
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

BELL, M. C.
Fish Passage Through Turbines, Conduits, and Spillway Gates,
W76-08651 8I

BELSER, L. W.
Nitrate Reduction and Associated Microbial Populations in a Ponded Hanford Sandy Loam,
W76-08546 5G

BENNETT, O. L.
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

BERGSTROM, S.
The Development of a Snow Routine for the HBV-2 Model,
W76-08338 2C

BERTRAND, R. M.
Pollution Problem Solver,
W76-08483 5D

BETTERTON, C.
Studies on the Host Specificity of the Eyefluke Diplostomum Spathaceum, in Brown and Rainbow Trout,
W76-08302 5C

BHASIN, R. N.
Pore Size Distribution of Compacted Soils After Critical Region Drying,
W76-08416 2G

BHATTI, M. S.
Momentum Transfer in Hydrodynamically Developing Laminar Flow in a Straight Channel,
W76-08318 8B

BIBKO, P. N.
Preliminary Studies on the Effects of Air Bubbles and Intense Illumination on the Swimming Behavior of the Striped Bass (Morone Saxitalis) and the Gizzard Shad (Dorosoma Cepedianum),
W76-08658 8I

BIDDLE, P.
Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

BIFFL, W.
Austrian Experiences Concerning Damages of Communal Purification Facilities by Industrial Effluents (Osterreichische Erfahrungen Betreffend Schaden an Kommunalen Klaranlagen Durch Industrieabwasser).
W76-08714 5D

BINNIE, A. M.
Suppression of Waves in Slotted-Walled Channel,
W76-08742 8B

BITCOVER, E. H.
Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

BLACK, L. T.
Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

BLAD, B. L.
Canopy Temperature Measurement of Sorghum and Millet with Leaf Thermocouple and Infrared Thermometer Techniques,
W76-08590 2D

Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

Resistance-Mass Transfer Method for Estimating Evapotranspiration: Comparison with Lysimetric Measurements in Irrigated Sorghum,
W76-08588 2D

Thermal Scanner Measurements of Crop Temperatures to Estimate Evapotranspiration,
W76-08591 2D

BLANC, F.
Planktonic Ecosystems: The Effects of Dystrophic Conditions on Structure and Function in the Gulf of Fos, (In French),
W76-08312 5C

BLANCHARD, B. J.
Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

BOARDMAN, E. B.
Ims-Grangcold Pelletizing System for Steel Mill Wastes Material,
W76-08491 5D

BOCK, P.
The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

BOJANOWSKI, R.
A Procedure for Analysis of Amercium in Marine Environmental Samples,
W76-08611 5A

BOLER, L. J.
Combination Sewage Treatment and Cooling System,
W76-08242 5D

BOLSENGA, S. J.
Eastern Lake Ontario Precipitation Network,
W76-08412 2B

Lake Huron Surface Water Temperature, May-November, 1966,
W76-08141 2H

BONACINA, C.
An Ecologic Survey of Lake Endine, (In Italian),
W76-08244 5C

BONANNO, A. J.
Process and Apparatus for Recovering Clean Water From Aqueous Wastes,
W76-08408 5D

BONDIETTI, E. A.
Interaction of Plutonium with Complexing Substances in Soils and Natural Waters,
W76-08605 5B

BONIN, M. C.
Planktonic Ecosystems: The Effects of Dystrophic Conditions on Structure and Function in the Gulf of Fos, (In French),
W76-08312 5C

BOONE, R. D.
Irrigation System (Lifting Dogs),
W76-08398 3F

BORDON, D. C. JR.
Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

BORGMAN, L. E.
Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

BORTLESON, G. C.
Data on Selected Lakes in Washington, Part 3,
W76-08564 2H

Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

BOSZCZYK, H.
The Effects of High Sodium Chloride Concentrations and High Pollutant Loads on the Composition of the Activated Sludge Microflora in the Treatment of Petroleum Refinery-Generated Effluents (Wplyw wysokiego Stezenia Chlorku Sodowego I Duzego Ladunku Zanieczyszczen Na Sklad Milroflory Osadu Czynnego Przy Oczyszczaniu Sciekow Rafineryjno-Petrochemicznych).
W76-08464 5D

BOU, C.
Research Studies on the Fauna of the Greek Subterranean Waters, (In French),
W76-08296 2L

BOUGH, W. A.
Coagulation with Chitosan - An Aid to Recovery of By-Products from Egg Breaking Wastes,
W76-08289 5D

BOULENGER, P.
Purification of Effluent,
W76-08206 5D

BOUWER, H.
Infiltration into Increasingly Permeable Soils,
W76-08516 2G

BOVET, E. D.
Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality,
W76-08152 6B

BOWEN, V. T.
Comparison of the Distributions in Marine Sediments of the Fallout Derived Nuclides Fe 55 and Pu 239,240, A New Approach to the Chemistry of Environmental Radionuclides,
W76-08603 5B

Distributions of Transuranium Nuclides in Sediment and Biota of the North Atlantic Ocean,
W76-08602 5B

Double-Tracer Studies to Optimize Conditions for the Radiochemical Separation of Plutonium from Large Seawater Samples,
W76-08610 5A

Quality Control in Radiochemical Analysis,
W76-08609 5A

BOYLE, F. W.
Transfer of Boron and Tritiated Water Through Sandstone,
W76-08547 5B

BOYLEN, C. W.
Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

BRADFORD, W. L.
Distribution and Movement of Zinc and Other Heavy Metals in South San Francisco Bay, California,
W76-08561 5B

BRADLEY, E. B.
Detection of Salts of 2,4-D in Aqueous Solution by Laser Raman Spectroscopy,
W76-08254 5A

BRADSHAW, K. E.
Adjustable Soaker Hose Support Assembly,
W76-08197 3F

BRANDON, F. J.
Fiber Recovery Increases Water Re-Use, Reduces Treatment Cost,
W76-08489 5D

BRANSON, R. L.
Water Quality in Irrigated Watersheds,
W76-08679 5B

BRASK, G.I.
Cooperation Helps Erie,
W76-08481 5D

BRINK, D. L.
Method and Apparatus for the Destructive Decomposition of Organic Wastes Without Air Pollution and With Recovery of Chemical Byproducts,
W76-08459 5D

BROCARD, D. N.
One-Dimensional Temperature Predictions in Unsteady Flows,
W76-08738 5B

BROCKWAY, C. E.
Alternative Methods of Estimating Snow Water Parameters,
W76-08259 2C

BROOKS, A. S.
Effects of Condenser Entrainment on Algal Photosynthesis at Mid-Atlantic Power Plants,
W76-08637 5C

Entrainment of Planktonic Organisms into Cooling Water Systems of Three Mid-Atlantic Thermal Power Plants,
W76-08635 5C

Phytoplankton Entrainment Studies at the Indian River Estuary, Delaware,
W76-08636 5C

BROWN, H. E.
Multiple Use Evaluations on Ponderosa Pine Forest Land,
W76-08109 4A

BROWZIN, B. S.
Exit of Ground Waters on Drainage Boundaries,
W76-08750 2F

BRUCE, R. R.
A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

BRUNNER, P. G.
Influence of the Local Precipitation Quantity on the Loading of Water Bodies with Mixed Water (Der Einfluss der Oertlichen Neiderschlagshoehe auf die Belastung der Gewaesser Mit Mischwasser),
W76-08258 5B

BRYAN, M. L.
The Study of Fresh-Water Lake Ice Using Multiplexed Imaging Radar,
W76-08138 2C

BUCHMAIER, R. F.
Application of the Finite Element Method in Foundation Engineering (Die Anwendung der Methode der Finiten Elemente in der Grundbaupraxis),
W76-08423 8D

BUCKLEY, J. A.
Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus

BUCKLEY, J. A.

Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

BUCKNER, M. R.
Pollutant Transport in Natural Streams,
W76-08329 5B

BULLER, A. T.
The Role of Organic Detritus in the Formation of Distinctive Sandy Tidal Flat Sedimentary Structures, Tay Estuary, Scotland,
W76-08524 2L

BULLER, W.
Reassessment of Mercury in Surface Water in the Adirondack Region, New York,
W76-08554 2K

BURKE, J. C.
Distributions of Transuranium Nuclides in Sediment and Biota of the North Atlantic Ocean,
W76-08602 5B

BURNETT, W. E.
Rum Distillery Wastes: Laboratory Studies on Aerobic Treatment,
W76-08469 5D

BURNS, N. M.
Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

BUSSE, O.
Apparatus for Continuous Dewatering of Aqueous Suspensions,
W76-08202 5D

BUTLER, D. E.
Moisturizing Apparatus for Use with Wind Machines,
W76-08399 3F

CABRERA, G.
Dynamic Response of Aquifer Systems to Localized Recharge,
W76-08520 2F

CADOTTE, J. E.
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

CAHET, G.
Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

CALDERONI, A.
An Ecologic Survey of Lake Endine, (In Italian),
W76-08244 5C

CALDWELL, R. S.
Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

CALKINS, D. J.
Arching of Fragmented Ice Covers,
W76-08149 2C

CALVERT, D. V.
Nitrate, Phosphate, and Potassium Movement into Drainage Lines under Three Soil Management Systems,
W76-08680 5B

CAMBELL, R. E.
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

CAMERON, M. S.
New Incineration Method Solves Grease Problem in Richmond, Pa.,
W76-08485 5E

CAMP, W. J.
Waste Treatment and Control at Live Oak Poultry Processing Plant,
W76-08185 3E

CAMPBELL, M. D.
Planning Irrigation and Drainage Systems Using Retention and Extraction Limits,
W76-08553 3F

CARAWAN, R. E.
Use, Continued Use, and Reuse of Both Process and Waste Waters in Poultry Processing Operations,
W76-08299 3E

Water and Waste Management in Poultry Processing,
W76-08428 3E

CARDINAL, P. J. JR.
Process of Preparing Sewage Sludge for Dewatering,
W76-08409 5D

CARLISLE, D. B.
Effect of Crude Oil on Populations of Bacteria and Algae in Artificial Ponds Subject to Winter Weather and Ice Formation,
W76-08453 5C

CAROLLO, A.
An Ecologic Survey of Lake Endine, (In Italian),
W76-08244 5C

CARPENTER, E. J.
Summary of Entrainment Research at the Millstone Point Nuclear Power Station, 1970 to 1972,
W76-08632 5C

CARSON, R. J. III.
Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

CARTER, V.
ERTS-1 Investigation of Wetlands Ecology,
W76-08319 2L

CARVER, R. D.
Isotopic Analysis of Plutonium in Environmental Samples by Isotope Dilution Mass Spectrometry,
W76-08612 5A

CASPARIAN, R. E.
Process and Apparatus for Recovering Clean Water From Aqueous Wastes,
W76-08408 5D

CEBULA, E.
The Effects of High Sodium Chloride Concentrations and High Pollutant Loads on the Composition of the Activated Sludge Microflora in the Treatment of Petroleum Refinery-Generated Effluents (Wplyw wysokiego Stezenia Chlorku Sodowego I Duzego Ladunku Zanieczyszczen Na Sklad Milroflory Osadu Czynnego Przy Oczyszczaniu Sciekow Rafineryjno-Petrochemicznych).
W76-08464 5D

CHADWICK, H. K.
Entrainment and Thermal Effects on a Mysid Shrimp and Striped Bass in the Sacramento-San Joaquin Delta,
W76-08631 5C

CHAN, Y. K.
Improved Image-Well Technique for Aquifer Analysis,
W76-08517 4B

CHANGNON, S. A. JR.
Design of an Experiment to Suppress Hail in Illinois,
W76-08330 3B

CHANGRANEY, T. G.
Extreme Rainfall Studies of the Brahmani, The Burhabalang, The Rushikulya and the Subarnarekha River Catchments,
W76-08733 2B

CHASHCHUKHIN, V. A.
The State of Water in Plant Tissues at Negative Temperatures under Natural Conditions, (In Russian),
W76-08368 2I

CHATELET, A.
Toxic Action of Copper on the Gills of Carp (Cyprinus Carpio), (In French),
W76-08260 5C

CHATTERIEE, R. M.
Behaviour of Oil Under Canadian Climatic Conditions. Part 1. Oil on Water Under Ice-Forming Conditions,
W76-08365 5B

CHENG, T. C.
Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

CHERNYSH, G. P.
Decontamination of Wastewaters at the Stage of Potassium Arabonate in the Production of Vitamin B2, (In Russian),
W76-08578 5D

CHILDERS, J. M.
Channel Erosion Surveys Along Taps Route, Alaska, 1974,
W76-08559 2J

CHITTENDEN, M. E. JR.
Weight Loss, Mortality, Feeding, and Duration of Residence of Adult American Shad, Alosa Sapidissima in Fresh Water,
W76-08433 5C

CHIU, C-L.
Simulation of Hydraulic Processes in Open Channels,
W76-08344 8B

CHIVATE, V. R.
Measurement of Soil Moisture in Poona Black Cotton Soil Using an Infra-Red Moisture Balance,
W76-08734 2G

CHRISTENSEN, L. A.
A Framework for Evaluating Institutional and Socio-Economic Issues of Land Treatment of Waste Water,
W76-08681 5D

CHRISTENSEN, W. N.
Catalytic Filtering-Incinerating Process and Device for Waste Water,
W76-08400 5D

CHU, T. Y.
Investigation of Roadway Drainage as Related to the Performance of Flexible Pavements,
W76-08534 8B

CLABORN, B. J.
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

CLAEYS, R. R.
Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

CLARKE, R. T.
The Use of Likelihood Functions to Fit Conceptual Models with More than One Dependent Variable,
W76-08729 2G

CLARY, W. P.
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

Pinyon-Juniper Control--Does it Pay,
W76-08110 4A

Present and Future Multiple use Demands on the Pinyon-Juniper Type,
W76-08430 4A

COBIAN, K. E.
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

COHN, M. B.
An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

COLE, E. L.
Process for Treating Water-Soluble Organic Wastes,
W76-08482 5D

COLEMAN, N. T.
Rate of Chloride and Water Movement in Southern California Soils,
W76-08545 2G

COLLIER, B. N.
Chemistry and Effects of Chlorine in Aquatic Systems, A Selected, Annotated Bibliography,
W76-08592 5C

COLLINS, B. P.
Suspended Material Transport: Narragansett Bay Area, Rhode Island,
W76-08139 2L

COLLINS, S.
The Role of High Rate Bio-Filters in the Leather Industry,
W76-08180 5D

COMBRINCK, C.
Energy Content of the Benthos and Epifauna in the Pongola River, Natal, (In Afrikaans),
W76-08158 2I

COMER, G. H.
An Optimization Technique Adapted to USDAHL-74 Revised Model of Watershed Hydrology,
W76-08523 2A

CONGLETON, J. L.
Development of Biological Design Criteria for Fish Screens and Barriers,
W76-08662 8I

CONKLIN, F. S.
Economic Evaluation of Proposed Water Conservation Practices on Established Irrigation Districts: A General Methodology and Application to Three Districts in Oregon,
W76-08431 3F

CONOVER, S. A. M.
Nitrogen Utilization During Spring Blooms of Marine Phytoplankton in Bedford Basin, Nova Scotia, Canada,
W76-08691 5C

COONEY, R. T.
Oceanographic Conditions During 1973 in Russel Fjord, Alaska,
W76-08525 2L

COOPER, J. C.
Electrophysiological Studies of Morpholine-Imprinted Coho Salmon (Oncorhynchus Kisutch) and Rainbow Trout (Salmo Gairdneri),
W76-08438 5C

Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

COOPER, J. E.
Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

COOPER, S.
The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

COREY, F. C.
Irrigation System Management for Reducing Peak Electrical Demands,
W76-08549 3F

CORKUM, D. A.
On a Thermal Lag in the North Atlantic Ocean During a Climatic Change,
W76-08127 2L

CORRELL, D. L.
Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

COSP, J.
A Very Rapid Liming and Tanning Process Without Effluent,
W76-08181 3E

COULTER, K. R.
Cyanide Treatment in the Metal Finishing Industry,
W76-08271 5D

COUTANT, C. C.
Evaluation of Entrainment Effect,
W76-08629 8I

COVANT, D.
'We've Found a Real Time-Saver',
W76-08251 8C

CRANKSHAW,
Cooperation Helps Erie,
W76-08481 5D

CREW, H.
Dense Effluent Dispersion in a Stream,
W76-08316 5B

CROSS, F. A.
Plutonium in Atlantic Coastal Estuaries in the Southeastern United States of America,
W76-08600 5C

CROSSWHITE, W. M.
Economics of In-Plant Waste Management in Food Processing,
W76-08300 3E

Use, Continued Use, and Reuse of Both Process and Waste Waters in Poultry Processing Operations,
W76-08299 3E

Water and Waste Management in Poultry Processing,
W76-08428 3E

CROWDER, W. K.
Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

CRYER, R.
The Significance and Variation of Atmospheric Nutrient Inputs in a Small Catchment System,
W76-08728 5A

CUMMINS, K. W.
The Relationship Between Watershed Use and Stream Water Quality,
W76-08282 4D

CURDS, C. R.
A Theoretical Study of Factors Influencing the Microbial Population Dynamics of the Activated-Sludge Process-II. A Computer-Simulation Study to Compare Two Methods of Plant Operation,
W76-08277 5D

CURRY, J. B.
Coanda Effect Oil-Water Separator,
W76-08209 5G

CUTSHALL, N. H.
Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

CZYRSKA, H.
Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

DAIGNAULT, L. G.
Treatment of Photographic Ferrocyanide-Type Bleach Solutions for Reuse and Disposal,
W76-08472 5D

DATTA ROY, P. K.
Rainfall and Floods in India During 1974 Southwest Monsoon Period,
W76-08732 2B

DAVIES, R. M.
Entrainment of Planktonic Organisms into Cooling Water Systems of Three Mid-Atlantic Thermal Power Plants,
W76-08635 5C

Entrainment of Zooplankton at Three Mid-Atlantic Power Plants,
W76-08639 5C

DAVIS, D. B.
Catalytic Filtering-Incinerating Process and Device for Waste Water,
W76-08400 5D

DAVIS, K. B.
Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

DAVIS, S.
Drain Envelope Response to Field Treatments,
W76-08548 4A

DE BERNARDI, R.
An Ecologic Survey of Lake Endine, (In Italian),
W76-08244 5C

DE, S. M.
Some Aspects of Tannery Effluent Control,
W76-08175 5D

DEEMER, D. D.
Spray Irrigation of Polutry Processing Wastewater,
W76-08165 5D

DEHAVEN, C. G.
Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 1-5 MGD Plants, Plants for High Product Recovery,
W76-08118 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 3-25 MGD Low Pressure Plants,
W76-08119 3A

Engineering and Economic Study of Reverse Osmosis Sea Water Desalting Plants, Design of 1-10 MGD Seawater Plants,
W76-08284 3A

DEJOHN, P. B.
Treatment of Dye Wastes with Granular Activated Carbon,
W76-08716 5D

DELL, C. I.
Cultural Impact on the Geochemistry of Sediments in Lake Erie,
W76-08727 2J

DEPREE, D. O.
Solid Mineral and Regenerant Recovery for Ion-Exchange Resins,
W76-08199 3A

DERZHAVETS, A. Y.
Apparatus for Pumping Oil-Water Mixture from a Collection Vessel of a Floating Oil Collector into Settling Tanks,
W76-08403 5G

DESAI, C. S.
Properties of Expansive Clay Soils; Report 2, A Numerical Procedure for Predicting Heave with Time,
W76-08420 8D

DESHMUKH, S. B.
Effluent Treatment in Selected Organic Chemical Factories,
W76-08465 5D

DETAR, W. R.
Graphic Determination of Sub-Main Pipe Size for Solid-Set Sprinkler Irrigation on Steep, Non-Uniform Slopes,
W76-08682 3F

DEVRIES, J. J.
The Groundwater Outcrop-Erosion Model; Evolution of the Stream Network in the Netherlands,
W76-08515 2A

DEY, N. N.
Radioruthenium in Coastal Waters,
W76-08619 5A

DION, N. P.
Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

DOANE, W. M.
Removal of Heavy Metal Ions from Wastewater,
W76-08402 5D

DORNBUSH, J. N.
Egg-Processing Plant Wastes,
W76-08170 3E

DOUGAN, W. K.
Absorptiometric Determination of Iron with T.P.T.Z.,
W76-08273 5A

DOUGLAS, J. R.
The Use of Likelihood Functions to Fit Conceptual Models with More than One Dependent Variable,
W76-08729 2G

DOWNING, D. L.
Dry Caustic Peeling of Beets and Carrots Reduces Pollution,
W76-08504 5D

Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

DRACUP, J. A.
Transient Water Quality Modeling in Streams,
W76-08730 5B

DRAKE, S. H.
Studies on the Animal Communities in Two North Florida Salt Marshes. Part I. Fish Communities,
W76-08161 2L

DRINKWATER, K. F.
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

DUBE, S. K.
Extreme Rainfall Studies of the Brahmani, The Burhabalang, The Rushikulya and the Subarnarekha River Catchments,
W76-08733 2B

DUPZYK, I. A.
Isotopic Analysis of Plutonium in Environmental Samples by Isotope Dilution Mass Spectrometry,
W76-08612 5A

DUPZYK, R. J.
Isotopic Analysis of Plutonium in Environmental Samples by Isotope Dilution Mass Spectrometry,
W76-08612 5A

DURBIN, E. G.
Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

DUSEK, D. A.
Deep Tillage of Graded-Furrow-Irrigated Pullman Clay Loam,
W76-08543 3F

Limited Irrigation of Grain Sorghum in Alternating Strips with Wheat,
W76-08542 3F

DUTTON, J. W. R.
A Review of Methods for the Determination of Iodine-131 in the Marine Environment,
W76-08622 5A

A Review of Methods for the Determination of Radioactive and Stable Silver in the Marine Environment,
W76-08621 5A

A Review of Methods for the Determination of Radioactive and Stable Zirconium in the Marine Environment,
W76-08620 5A

A Study of the Stability of Some Radionuclides in Seawater,
W76-08625 5A

EAGLE, R.
Plutonium Radionuclides in the Groundwaters at Enewetak Atoll,
W76-08607 5B

EDE, A. N.
Ground Treatment Apparatus,
W76-08393 3F

EDINGTON, D. N.
Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

EGUCHI, T.
Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

EHRENBERGER, F.
Determination of Traces of Carbon in Solid and Liquid Wastes of Chemical Plants by Means of Thermal Conductivity Measurements (Bestimmung Von Spuren Kohlenstoff in Festen Und Fluessigen Abfallstoffen Der Chemischen Industrie Mit Hilfe Der Waermeleitfaehigkeitsmessung),
W76-08499 5A

EICHER, G. J.
Adaptation of Hydro Fish Facilities to Steam-Electric Stations,
W76-08654 8I

EICKE, H. F.
A Method for the Rapid Enrichment and Determination of Silver-110m and Iodine-131 from Seawater,
W76-08624 5A

EL-SABH, M. I.
Surface Circulation Pattern in the Gulf of St. Lawrence,
W76-08126 2L

ELDER, J. A.
A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

ELLIS, D. F.
Nitrogen and Phosphorus Losses from Winter Disposal of Dairy Manure,
W76-08159 5C

EMILIANI, F.
New Methods for Ecological Analysis of Microorganisms of Eutrophic Waters, (In Spanish),
W76-08252 5A

EMMERSON, D. W.
The Long Hard Road to the Effluent-Free Pulp Mill,
W76-08698 5D

ENFIELD, C. G.
Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

ENGLERT, T. L.
Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

ENTWISTLE, J. E.
The Electrolytic Processing of Cyanide Wastes,
W76-08706 5D

EVENSON, D. E.
A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

FALKENMARK, M.
The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

FARMER, G. S.
Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

FARMER, R. C.
Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

FARR, W. E.
Mechanical Operation of Horizontal Traveling Screen Model VII,
W76-08649 8I

Traveling Screens for Turbine Intakes of Hydroelectric Dams,
W76-08647 8I

FAUST, M. A.
Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

FENN III, R. W.
Method for Treating Sewage Water,
W76-08394 5D

FERGUSON, R. L.
Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

FETTER, C. W. JR.
Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

FFOLLIOTT, P. F.
Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

FIERING, M.
Examination of the Concept and Use of the Standard Project Flood,
W76-08321 8B

FILACHIONE, E. M.
Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

FILISTOVICH, V. R.
Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

FINA, L. R.
Demand Bactericide for Disinfecting Water and Process of Preparation,
W76-08391 5D

FINTSCHENKO, P.
Pickling with Hydrogen Peroxide Solutions,
W76-08479 5D

FISHER, W. S.
Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

FLAKE, R. H.
Shooting Models for Salinity and Coliform,
W76-08134 5B

FLEISCHER, P.
Field Performance of Permeable Breakwater,
W76-08684 8A

FLEMER, D. A.
Biochemical Studies of Entrained Phytoplankton at the Morgantown Maryland Power Plant,
W76-08642 5C

The Effects of Entrainment on Phytoplankton at the Morgantown Steam Electric Station, Potomac River Estuary, September 5-8, 1972,
W76-08641 5C

FLEMING, B.
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

FOKIN, A. V.
Cleaning of Industrial Effluent,
W76-08719 5D

FONG, C. C.
Fluoride Removal: Technology and Cost Estimates,
W76-08703 5D

FORAN, D.
The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

FOREMAN, G. E.
Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

FORESTER, R. H.
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

FOSTER, P. D.
Decolorizing Method for Waste Kraft Paper Mill Effluents,
W76-08207 5D

FOURNIER, L. B.
A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

FOWLER, R. E.
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

FOWLER, T. R.
Impact of Remote Sensing Upon the Planning, Management, and Development, and Development of Water Resources,
W76-08536 6B

FOX, R. L.
Development of Assymmetric Cellulose Triacetate Membranes for Seawater Desalination,
W76-08283 3A

FRECH, S.
Impact of Remote Sensing Upon the Planning, Management, and Development, and Development of Water Resources,
W76-08536 6B

FRENZEL, C. A.
Detection of Salts of 2,4-D in Aqueous Solution by Laser Raman Spectroscopy,
W76-08254 5A

FUKAI, R.
Intercalibration of Methods for Radionuclide Measurements on a Seaweed Sample,
W76-08626 5A

FUKAI, R.

Results of Plutonium Intercalibration in Seawater and Seaweed Samples,
W76-08616 5A

FUKUMORI, R.
Treatment Method for Oil-Containing Liquid Waste (Ganyu haisui shoriho),
W76-08475 5D

FULLER, R. H.
Water Quality in the Mad River Basin, Humboldt and Trinity Counties, California,
W76-08562 5A

GALLAGHER, B. J.
Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

GALLAGHER, R. H.
Steady Stratified Circulation in a Cavity,
W76-08136 2H

GALLGHER, J. L.
Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

GAMBARYAN, M. E.
Rearing the Sevan Trout at the Aigerlich Trout Pond Fishery, (In Armenian),
W76-08371 2I

GAMBOLATI, G.
Transient Free Surface Flow to a Well: An Analysis of Theoretical Solutions,
W76-08333 2F

GANDON, R.
Determination of Radionuclides of Ce, Co, Fe, Ru, Zn and Zr in Seawater by Preconcentration of Colloidal Manganese Dioxide, Application to the Determination of Low Level Ruthenium 106,
W76-08618 5A

GATTO, L. W.
Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

GATZ, J. L.
Improvement of Core Drill Methods,
W76-08419 8D

GEORGE, H. D.
Ims-Grangcold Pelletizing System for Steel Mill Wastes Material,
W76-08491 5D

GHILDYAL, B. P.
Thermal Properties of Fine Textured Mollisols Under Varying Moisture Conditions,
W76-08364 2G

GIBSON, M.
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

GILDE, L. C.
Land Treatment of Food Processing Wastewaters,
W76-08468 5E

GISH, W. B.
Load and Voltage Control Algorithms for Grand Coulee Powerplant,
W76-08112 8C

GNIESER, J.
Biological Processes for Effluent and Waste Treatment Exemplified by the Paper Industry (Biologische Verfahren Zur Abwasser- Und Abfallaufbereitung am Beispiel der Paper-Industrie),
W76-08699 5D

GOLDWYN, G.
Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

GONCHARUK, E. I.
Hygienic Substantiation of the Possibility of Wastewater Treatment of Poultry Processing Plants on Underground Filter Beds, (In Russian),
W76-08581 5D

GRAEBEL, W. P.
Fast Current Oil Control Study,
W76-08748 5G

GREEN, C. D.
The Role of Organic Detritus in the Formation of Distinctive Sandy Tidal Flat Sedimentary Structures, Tay Estuary, Scotland,
W76-08524 2L

GREEN, E. J.
Underground Irrigation System,
W76-08406 3F

GREENFIELD, C.
Process and Apparatus for Recovering Clean Water From Aqueous Wastes,
W76-08408 5D

GREENKORN, R. A.
Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

GREIG, R. A.
Mercury Concentrations in Fish, North Atlantic Offshore Waters--1971,
W76-08360 5A

GRIFFIN, E. L.
Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

GRIGG, N. S.
Development of Storm Drainage Cost Functions,
W76-08227 3D

GRINVAL'D, D. I.
Dissipation of Turbulent Energy in a Natural Channel,
W76-08744 8B

GRUBERT, J. P.
Numerical Computation of Two-Dimensional Flows,
W76-08341 2L

GUEGUENIAT, P.
Determination of Radionuclides of Ce, Co, Fe, Ru, Zn and Zr in Seawater by Preconcentration of Colloidal Manganese Dioxide, Application to the Determination of Low Level Ruthenium 106,
W76-08618 5A

GUN'KO, A. F.
Biological Background of the New Element of Sturgeon Artificial Rearing Methods, (In Russian),
W76-08663 8I

GUNTERMANN, K.
Soil Loss from Illinois Farms - Economic Analysis of Productivity Loss and Sedimentation Damage,
W76-08533 4D

GUPTA, S. P.
Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

GURTZ, M. E.
Response of Phytoplankton to Thermal Stress,
W76-08644 5C

GUTNICK, D.
Cleaning of Cargo Compartments,
W76-08198 5G

HACKL, A.
Recycling--Examples for Its Possibilities and Limits (Recycling--Beispiele fuer Moeglichkeiten und Grenzen),
W76-08701 5D

HAGAN, R. M.
Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

HAGERTY, D. J.
Refuse into Power,
W76-08693 5D

HAITH, D. A.
Land Use and Water Quality in New York Rivers,
W76-08133 5B

HALVORSON, A. D.
Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

HANSEN, J. E.
Self Propelled Sprinkling Irrigation Apparatus,
W76-08407 3F

HANSON, C. H.
A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part I: Model Studies and Fouling Control Techniques,
W76-08660 8I

HAPPICH, W. F.
Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

HAQUE, I.
An Experiment on the Feeding of Fry of Catfish Heteropneustes Fossilis,
W76-08575 2I

HAQUE, M. K.
An Experiment on the Feeding of Fry of Catfish Heteropneustes Fossilis,
W76-08575 2I

HARDISON, C. H.
Interstation Correlation of Peak-Flow Estimates,
W76-08555 4A

HARENBERG, O.
A Very Rapid Liming and Tanning Process Without Effluent,
W76-08181 3E

HARLEMAN, D. R. F.
One-Dimensional Temperature Predictions in Unsteady Flows,
W76-08738 5B

Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

HARLEY, J. H.
Quality Control in Radiochemical Analysis,
W76-08609 5A

HARPER, L. A.
A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

HARRIS, F. S. JR.
Laser Applications to Atmospheric Sciences - A Bibliography,
W76-08323 10C

HARRIS, W. L.
Zero Energy Input Flocculator,
W76-08200 5F

HART, G. K.
Commercial Membrane Desalting Plants: Data and Analysis,
W76-08370 3A

HART, J. A.
Waste Water Recycled For Use in Refinery Cooling Towers,
W76-08270 5D

HASLER, A. D.
Electrophysiological Studies of Morpholine-Imprinted Coho Salmon (Oncorhynchus Kisutch) and Rainbow Trout (Salmo Gairdneri),
W76-08438 5C

Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

HASSELMANN, K.
A Parametric Wave Prediction Model,
W76-08337 2L

HATCH, D. J.
The Estimation of Local Rainfall by Sample Gauging,
W76-08348 2B

HAUCK, R. A.
Report on Methods of Chrome Recovery and Reuse from Spent Chrome Tan Liquor,
W76-08174 5D

HAUGEN, R. K.
Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

HAUKHMAN, Z. S.
Phytoplankton in Northern Donetsk Ponds for Additional Treatment, (In Ukranian),
W76-08577 5C

HAUTALA, E.
Removing Heavy Metal Ions from Water,
W76-08401 5D

HAYES, D. W.
Plutonium in Atlantic Coastal Estuaries in the Southeastern United States of America,
W76-08600 5C

Pollutant Transport in Natural Streams,
W76-08329 5B

HAYES, E. R.
Kraft Effluent Treatment by Flotation,
W76-08463 5D

HAYNES, K. E.
Environmental Quality and Inflation: A Regional Perspective on the Cost-Push Impact of the 1972 Pure Water Legislation,
W76-08151 5G

HAZZARD, N. D.
Metallic Recovery System,
W76-08493 5D

HECHT, L. G.
The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

HEFFNER, R.
Entrainment Studies on Hudson River Organisms,
W76-08633 5C

HEIDEMANN, E.
A Very Rapid Liming and Tanning Process Without Effluent,
W76-08181 3E

HEIL, R. D.
The Impact of Molybdenum-Enriched Irrigation Water on Agricultural Soils Near Brighton, Colorado,
W76-08675 5B

HEILMAN, J. L.
Canopy Temperature Measurement of Sorghum and Millet with Leaf Thermocouple and Infrared Thermometer Techniques,
W76-08590 2D

An Evaluation of a Resistance Form of the Energy Balance to Estimate Evapotranspiration,
W76-08587 2D

Thermal Scanner Measurements of Crop Temperatures to Estimate Evapotranspiration,
W76-08591 2D

HEINLE, D. R.
Zooplankton Studies at Morgantown,
W76-08640 5C

HENDRICKSON, T. N.
Treatment of Photographic Ferrocyanide-Type Bleach Solutions for Reuse and Disposal,
W76-08472 5D

HENSON, W. H.
An Optimization Technique Adapted to USDAHL-74 Revised Model of Watershed Hydrology,
W76-08523 2A

HESS, H. V.
Process for Treating Water-Soluble Organic Wastes,
W76-08482 5D

HETHERINGTON, J. A.
Environmental and Public Health Consequences of the Controlled Disposal of Transuranic Elements to the Marine Environment,
W76-08604 5C

HEWLETT, J. D.
First-Year Water Yield Increase After Forest Cutting: An Alternative Model,
W76-08362 4C

HIGGINS, G. T.
Data on Selected Lakes in Washington, Part 3,
W76-08564 2H

HILER, E. A.
Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

HILL, D. M.
Natural and Agricultural Ecosystems,
W76-08667 6G

HINWOOD, J. B.
Two-Dimensional Mathematical Water Quality Model,
W76-08135 5B

HODENBENNER, K.
Re-Use and Disposal of Waste Acids,
W76-08721 5D

HOFFMAN, L.
Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

HOLLADAY, G.
Plutonium Radionuclides in the Groundwaters at Enewetak Atoll,
W76-08607 5B

HOLST, A. M.
Fast Replacement of a Flood-Damaged Interceptor,
W76-08240 8F

HOLTON, R.
Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

HOPKINS, T. L.
Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

HOPWOOD, A. P.
Protein and Fat Recovery from Effluents,
W76-08172 5D

HORNBURG, C. D.
Commercial Membrane Desalting Plants: Data and Analysis,
W76-08370 3A

HOROWITZ, J.
The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

HORRALL, R. M.
Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

HOUSTON, R. S.
Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

HOWELL, T. A.
Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

HRONCICH, M. J.
Perforated-Pipe Water Intake for Fish Protection,
W76-08137 8I

HUBER, C. V.
Combined Treatment of Leather Tanning and Municipal Wastes at Grand Haven, Michigan,
W76-08294 5D

HUGHES, G. H.
Hydrology of the Three Sinkhole Basins in Southwestern Seminole County, Florida,
W76-08572 4A

HUMPHRIES, W. K.
Investigation of Roadway Drainage as Related to the Performance of Flexible Pavements,
W76-08534 8B

HUNTER, J. R.
Culture and Growth of Northern Anchovy, Engraulis Mordax Larvae,
W76-08432 2L

HUQ, M. F.
An Experiment on the Feeding of Fry of Catfish Heteropneustes Fossilis,
W76-08575 2I

HUTCHINS, R. A.
Treatment of Dye Wastes with Granular Activated Carbon,
W76-08716 5D

HUTCHINSON, T. C. AND
Heavy Metal Toxicity and Synergism to Floating Aquatic Weeds,
W76-08454 5C

HYDE, J. A.
Economical Foam Control in Wastewater Treatment Systems,
W76-08249 5D

IBBETT, R. D.
A Study of the Stability of Some Radionuclides in Seawater,
W76-08625 5A

ICANBERRY, J. W.
Zooplankton Survival in Cooling Water Systems of Four Thermal Power Plants on the California Coast-Interim Report. March 1971-January 1972,
W76-08630 5C

IL'YASOVA, Z. Y.
Some Problems of the Ecology of the Sary-Chilek Marinka Schizothorax Intermedius Eury-Cephalus Spelter, (In Russian),
W76-08243 2H

IMAI, S.
Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

INNES, J. K.
Data on Selected Lakes in Washington, Part 3,
W76-08564 2H

ISAEV, G. D.
Settling Tank,
W76-08495 5D

ITO, T.
Elimination Method for Mercury Residue in Water (Suichu yozon suigin no jokyoho),
W76-08476 5D

ITSKOVA, A. I.
Drinking Water Purification in Industrially Manufactured Compact Installations of the Type 'Struya', (In English),
W76-08579 5F

IVANOV, A. I.
Sulphuric Acid Containing Rinses, Purification,
W76-08506 5D

JACKSON, D. R.
The Impact of Molybdenum-Enriched Irrigation Water on Agricultural Soils Near Brighton, Colorado,
W76-08675 5B

JACKSON, J. L.
Self Propelled Sprinkling Irrigation Apparatus,
W76-08407 3F

JAIN, S. C.
Thermal-Hydraulic Model Study of Offshore Discharge System for Kahe Power Plant, Hawaii,
W76-08508 5B

JAMES, E.
Optimal Pollution Control and Trade in Collective Goods,
W76-08367 5G

JAQUET, J-M.
Computations of Physical Transport and Regeneration of Phosphorus in Lake Erie, Fall 1970,
W76-08531 5B

Cultural Impact on the Geochemistry of Sediments in Lake Erie,
W76-08727 2J

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

Surficial Sediments of Lake Erie,
W76-08725 2J

JEANNE-LEVAIN, N.
The Effects of Lindane on the Morphology and the Growth of Some Unicellular Organisms, (In French),
W76-08676 5C

JEFFERIES, D. F.
Environmental and Public Health Consequences of the Controlled Disposal of Transuranic Elements to the Marine Environment,
W76-08604 5C

JENSEN, L. D.
Effects of Condenser Destruction of Algae on Dissolved Oxygen Levels in the James River,
W76-08638 5C

Effects of Condenser Entrainment on Algal Photosynthesis at Mid-Atlantic Power Plants,
W76-08637 5C

Entrainment of Planktonic Organisms into Cooling Water Systems of Three Mid-Atlantic Thermal Power Plants,
W76-08635 5C

Entrainment of Zooplankton at Three Mid-Atlantic Power Plants,
W76-08639 5C

JENSEN, S. E.
A Model for Estimating Actual Evapotranspiration from Potential Evapotranspiration,
W76-08132 2D

JIRKA, G. H.
Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

JOHNSEN, T. N. JR.
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

JOHNSON, L. D.
Properties of Expansive Clay Soils; Report 2, A Numerical Procedure for Predicting Heave with Time,
W76-08420 8D

JOHNSON, L. E.
Guidelines for Material Placement in Marsh Creation,
W76-08325 5G

JOHNSON, R. E.
Field Performance of Permeable Breakwater,
W76-08684 8A

JONES, G. E.
Combined Treatment of Leather Tanning and Municipal Wastes at Grand Haven, Michigan,
W76-08294 5D

JONES, R. B.
Industrial Waste Treatment System Reduces Pollution,
W76-08711 5D

JONES, S. H.
Channel Erosion Surveys Along Taps Route, Alaska, 1974,
W76-08559 2J

JOSEPH, J. J.
Design and Performance of Physical-Chemical and Activated Sludge Treatment for an Edible Oil Plant,
W76-08293 5D

JOTSOVA-BAURENSKA, N.
Dependence of Stomatal Number and Size in Juglans Regia L. on Ecological Conditions, (In Bulgarian),
W76-08668 2I

JUNG, G. A.
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

JUNKER, W.
Apparatus for Continuous Dewatering of Aqueous Suspensions,
W76-08202 5D

KADDAH, M. T.
Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

KAJIHARA, T. U. Y.
Sessile Animals on Tar Globules in the Waters Around the Ryukyu Islands, (In Japanese),
W76-08232 2L

KANAROWSKI, S. M.
Evaluation of Bentonite Clay for Waterproofing Foundation Walls Below Grade,
W76-08427 8D

KANEMASU, E. T.
Canopy Temperature Measurement of Sorghum and Millet with Leaf Thermocouple and Infrared Thermometer Techniques,
W76-08590 2D

An Evaluation of a Resistance Form of the Energy Balance to Estimate Evapotranspiration,
W76-08587 2D

Great Plains Evapotranspiration by a Resistance Model Using Remotely Sensed Thermal Imagery,
W76-08585 2D

Thermal Scanner Measurements of Crop Temperatures to Estimate Evapotranspiration,
W76-08591 2D

KARADI, G. M.
Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

KARBE, L.
The Influence of Water Quality on Accumulation of Heavy Metals in Aquatic Organisms,
W76-08456 5C

KARDOS, L. T.
Oxygen Relationships in a Soil Treated with Sewage Effluent,
W76-08231 5D

KARTTUMEN, J.
Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

KAZLOVA, ZH. I.
Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

Soil Moisture Regime and Pigment Content in Leaves of Cereals, (In Belorussian),
W76-08304 3F

KEITH, D. E.
A Simple Continuous-Flow Respirometer for Comparative Respiratory Changes in Medium-Sized Aquatic Organisms,
W76-08353 5C

KEIZER, P. D.
Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

KELKAR, R. R.
Measurement of Soil Moisture in Poona Black Cotton Soil Using an Infra-Red Moisture Balance,
W76-08734 2G

KEMP, A. L. W.
Cultural Impact on the Geochemistry of Sediments in Lake Erie,
W76-08727 2J

Surficial Sediments of Lake Erie,
W76-08725 2J

KENNEDY, J. F.
Thermal-Hydraulic Model Study of Offshore Discharge System for Kahe Power Plant, Hawaii,
W76-08508 5B

KERR, E. D.
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

KIBLER, D. F.
A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

KINMAN, R. N.
Treatment of Tannery Wastewater from Bona Allen, Inc., Buford, Georgia,
W76-08177 5D

KIRCHNER, A.
The Effect of Mineral Environment on the Geohydrological Situation in Low Bog Sites, (In German),
W76-08184 2H

On the Occurrence of Pressure Water in Low Bogs, (In German),
W76-08105 2H

KLANCKO, J.
Industrial Waste Treatment System Reduces Pollution,
W76-08711 5D

KLAUSNER, S. D.
Nitrogen and Phosphorus Losses from Winter Disposal of Dairy Manure,
W76-08159 5C

Oxygen Relationships in a Soil Treated with Sewage Effluent,
W76-08231 5D

KLEEMAN, W. T.
Environmental Quality and Inflation: A Regional Perspective on the Cost-Push Impact of the 1972 Pure Water Legislation,
W76-08151 5G

KLEIN, D. A.
The Responses of Soils and Soil Microorganisms to Silver Iodide Weather Modification Agents,
W76-08670 2G

KLESPER, H.
Apparatus for Continuous Dewatering of Aqueous Suspensions,
W76-08202 5D

KLINGAMAN, E. D.
Evaluation of Methods for Preserving the Levels of Soluble Inorganic Phosphorus and Nitrogen in Unfiltered Water Samples,
W76-08157 5A

KNILL, J. L.
Artificially Simulating the Geological History of Clay,
W76-08421 8D

KNUDSON, K.
Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

KNUTSON, K. M.
Biological Changes in the South St. Paul Sewage Treatment Plant Before and After Treatment with FeCl3 and Nalcolyte 675 Coagulating Agents,
W76-08290 5D

KOBAYASHI, T.
A Continuous Method of Monitoring Water Quality by Chlorine Consumption Under Ultraviolet Radiation. I. Design and Performance Test of Continuous Chlorine Consumption Meter and Application to Raw Waters of A Water Purification Plant, (In Japanese),
W76-08276 5A

KOCH, D.
Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

KOCH, N. C.
Geology and Water Resources of Marshall County, South Dakota--Part 1: Geology and Water Resources,
W76-08558 4A

KOFF, I.
Particle Vaporizer,
W76-08148 3B

KOGAN, B. I.
Efficient Chemical Method for the Treatment of Zinc Manufacturing Plant Generated Waste Waters (Effektivnyy khimicheskikh sposob ochistki stochnykh vod tsinkovogo zavoda),
W76-08268 5D

KOGAN, P. G.
Apparatus for Pumping Oil-Water Mixture from a Collection Vessel of a Floating Oil Collector into Settling Tanks,
W76-08403 5G

KOMAR, P. D.
Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

KORABEL'NIKOV, V. M.
Drinking Water Purification in Industrially Manufactured Compact Installations of the Type 'Struya', (In English),
W76-08579 5F

KORBITZ, W. E.
Fast Replacement of a Flood-Damaged Interceptor,
W76-08240 8F

KORELYAKOVA, I. L.
A Brief Characterization of Shoals and Their Plant Cover in the Kremenchug Reservoir, (In Russian),
W76-08697 2H

KORENKOV, V. N.
Process for Purification of Industrial Waste Waters from Perchlorates and Chlorates,
W76-08395 5D

KORGEN, B. J.
A Seabed Drifter Study of Near-Bottom Circulation in North Carolina Shelf Waters,
W76-08350 2L

KRAMLICH, W. E.
Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

KRASOVSKII, L. I.
The State of Water in Plant Tissues at Negative Temperatures under Natural Conditions, (In Russian),
W76-08368 2I

KRAWIEC, R. W.
Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

KRAYEV, V. F.
The Effect of Forest Stands on the Water Content of Rocks of the Loess Cover in the Western Regions of the Northern Black Sea Area, (In Ukranian),
W76-08303 4A

KREMEN, S. S.
Development of Assymmetric Cellulose Triacetatc Membranes for Seawater Desalination,
W76-08283 3A

Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

KRISTENSEN, K. J.
A Model for Estimating Actual Evapotranspiration from Potential Evapotranspiration,
W76-08132 2D

KRIZEK, R. J.
Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

KUBO, R.
Elimination Method for Mercury Residue in Water (Suichu yozon suigin no jokyoho),
W76-08476 5D

KUECK, D. R.
Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

KUESER, P. E.
Preliminary Studies on the Effects of Air Bubbles and Intense Illumination on the Swimming Behavior of the Striped Bass (Morone Saxitalis) and the Gizzard Shad (Dorosoma Cepedianum),
W76-08658 8I

KUHNLE, J. A.
Removing Heavy Metal Ions from Water,
W76-08401 5D

KUNDU, P. K.
Ekman Veering Observed Near the Ocean Bottom,
W76-08129 2L

Some Three-Dimensional Characteristics of Low-Frequency Current Fluctuations Near the Oregon Coast,
W76-08336 2L

KUROCHKINA, L. L.
Carbohydrate Transformation in Wheat and Rye Plants Under Effect of Flooding in the Autumn-Winter Period, (In Russian),
W76-08307 3F

KURZEME, M.
Earth Pressure Observations on a Retaining Wall in Expansive Clay, Gougher Street Mail Exchange, Adelaide,
W76-08424 8D

KUTSUKI, T.
Pressurized Oxidation of Pulp Spent Liquor (Parupu haieki no kaatsu snaka),
W76-08696 5D

KUZNETSOV, S. I.
Process for Purification of Industrial Waste Waters from Perchlorates and Chlorates,
W76-08395 5D

KYRYLENKO, A. S.
Phytoplankton in Northern Donetsk Ponds for Additional Treatment, (In Ukranian),
W76-08577 5C

LABAT, R.
Toxic Action of Copper on the Gills of Carp (Cyprinus Carpio), (In French),
W76-08260 5C

LABEYRIE, L. D.
Comparison of the Distributions in Marine Sediments of the Fallout Derived Nuclides Fe 55 and Pu 239,240, A New Approach to the Chemistry of Environmental Radionuclides,
W76-08603 5B

LACKEY, J. B.
Entrainment Studies at Turkey Point on Biscayne Bay: Have Thermal Effects Affected the Plankton of Biscayne Bay,
W76-08645 5C

LAL, P.
A Comparative Study of the Effect of Qualities of Irrigation Water on Different Soils,
W76-08301 3C

LAM, D. C. L.
Computations of Physical Transport and Regeneration of Phosphorus in Lake Erie, Fall 1970,
W76-08531 5B

Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

LAMBERT, J. L.
Demand Bactericide for Disinfecting Water and Process of Preparation,
W76-08391 5D

LAMMI, J. O.
Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

LANDRY, A. M. JR.
Numbers of Individuals and Injury Rates of Fishes Caught on Revolving Screens at the P. H. Robinson Generating Station,
W76-08653 8I

LANGFORD, K. J.
Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

LAPIN, V. I.
Some Characteristics of Fat Metabolism in Two Forms of Char Salvelinus Alpinus (L.) From Lake Azabach (Kamchatka), (In Russian),
W76-08310 2H

LARSEN, D. P.
A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

LARSON, R. W.
The Study of Fresh-Water Lake Ice Using Multiplexed Imaging Radar,
W76-08138 2C

LAUER, G. J.
Entrainment Studies on Hudson River Organisms,
W76-08633 5C

LAUZANNE, L.
The Selection of Prey in 3 Malacophagous Fishes of Lake Chad, (In French),
W76-08178 2H

LAWES, B. C.
A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

LAWLER, J. P.
Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

LAWRENCE, A. J.
A Reconsideration of the Fiering Two-Station Model,
W76-08519 4A

LAWSON, D. E.
The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

LAZARO, T. R.
Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

LEACH, J. M.
Toxic Constituents in Pulp Mill Effluents,
W76-08458 5A

LEAFE, M. K.
The Role of High Rate Bio-Filters in the Leather Industry,
W76-08180 5D

LEARY, R. D.
Lake Michigan Gets Help,
W76-08246 5D

LEDUC, G.
The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

LEE, C. Y.
Dry Caustic Peeling of Beets and Carrots Reduces Pollution,
W76-08504 5D

LEE, J. H.
Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

LEE, M. T.
Soil Loss from Illinois Farms - Economic Analysis of Productivity Loss and Sedimentation Damage,
W76-08533 4D

LEENDERTSE, J. J.
A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

LEHR, J. H.
Ground Water Flow No Longer a Mystery,
W76-08114 2F

LEMBKE, W. D.
Planning Irrigation and Drainage Systems Using Retention and Extraction Limits,
W76-08553 3F

LEMKE, A. A.
Apparatus for Flushing Sewers,
W76-08262 5D

LEONARD, M.
Thermal-Hydraulic Model Study of Offshore Discharge System for Kahe Power Plant, Hawaii,
W76-08508 5B

LEONARD, R. A.
A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

LEROY, J. H.
Plutonium in Atlantic Coastal Estuaries in the Southeastern United States of America,
W76-08600 5C

LEVEAU, M.
Planktonic Ecosystems: The Effects of Dystrophic Conditions on Structure and Function in the Gulf of Fos, (In French),
W76-08312 5C

LEWIS, C. F. M.
Surficial Sediments of Lake Erie,
W76-08725 2J

LIEVANO, R. J.
What Does a 'Clean' Environment Cost,
W76-08150 5G

LIGGETT, J. A.
Steady Stratified Circulation in a Cavity,
W76-08136 2H

LIGON, J. T.
Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

LILLELUND, K.
Considerations of Testing the Accumulation of Pesticides by Means of Artificial Food Chains,
W76-08361 5A

LIN, H-C.
Simulation of Hydraulic Processes in Open Channels,
W76-08344 8B

LINDSAY, W. L.
The Impact of Molybdenum-Enriched Irrigation Water on Agricultural Soils Near Brighton, Colorado,
W76-08675 5B

LINTHURST, R. A.
Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

LIPNER, H. D.
Water Filter Assembly,
W76-08392 8C

LIU, H-A.
Water Resources Planning for Rivers Draining into Mobile Bay, Part II: Non-Conservative Species Transport Models,
W76-08327 5B

LIU, S-K.
A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

LIVINGSTON, H. D.
Comparison of the Distributions in Marine Sediments of the Fallout Derived Nuclides Fe 55 and Pu 239,240, A New Approach to the Chemistry of Environmental Radionuclides,
W76-08603 5B

Distributions of Transuranium Nuclides in Sediment and Biota of the North Atlantic Ocean,
W76-08602 5B

Double-Tracer Studies to Optimize Conditions for the Radiochemical Separation of Plutonium from Large Seawater Samples,
W76-08610 5A

A Procedure for Analysis of Amercium in Marine Environmental Samples,
W76-08611 5A

LIZARRAGA-AREINIEGA, J. R.
Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

LOATS, H. L.
Impact of Remote Sensing Upon the Planning, Management, and Development, and Development of Water Resources,
W76-08536 6B

LOEHR, R. C.
The Kinetics of Microbial Nitrification,
W76-08369 5D

LOGAN, T. J.
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

LOOSEMORE, W. R.
Ultrasonic River Flow Measurement,
W76-08241 7B

LOTSPEICH, F. B.
Effects of Forest Fertilization on Two Southeast Alaska Streams,
W76-08673 5B

LOUCKS, R. H.
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

LOUTIT, M.
Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

LUCAS, Y.
Determination of Radionuclides of Ce, Co, Fe, Ru, Zn and Zr in Seawater by Preconcentration of Colloidal Manganese Dioxide, Application to the Determination of Low Level Ruthenium 106,
W76-08618 5A

LUDWICK, J. C.
Field Performance of Permeable Breakwater,
W76-08684 8A

LUNDBERG, P. E.
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

LUNDY, D. T.
Lake Michigan Gets Help,
W76-08246 5D

LYUKSHYN, V. S.
The Effect of Forest Stands on the Water Content of Rocks of the Loess Cover in the Western Regions of the Northern Black Sea Area, (In Ukranian),
W76-08303 4A

LYUTSAREV, S. V.
Organic Carbon, Phosphorus and Nitrogen in the Waters of the Sea of Japan, (In Russian),
W76-08313 5A

MACAGNO, E. O.
Numerical Prediction of Thermal-Regime of Rivers,
W76-08739 5B

MACGREGOR, J. S.
DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

MACON, J. A.
Use, Continued Use, and Reuse of Both Process and Waste Waters in Poultry Processing Operations,
W76-08299 3E

Water and Waste Management in Poultry Processing,
W76-08428 3E

MADDOCK, B. G.
The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

MADISON, D. M.
Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

MAHAN, D. C.
The Relationship Between Watershed Use and Stream Water Quality,
W76-08282 4D

MAHONEY, J.
Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

MAIER, C. R.
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

MAIER, D.
An Improved Method for Determination of the Chemical Oxygen Demand with Potassium Dichromate (Cod-Method) (Eine Verbesserte Methode zur Bestimmung des Chemischen Sauerstoffbedarfs mit Kaliumdichromat) (Cod-Methode),
W76-08256 5A

MALUEG, K. W.
A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

MANN, D. R.
Double-Tracer Studies to Optimize Conditions for the Radiochemical Separation of Plutonium from Large Seawater Samples,
W76-08610 5A

MANN, D. R.

A Procedure for Analysis of Amercium in Marine Environmental Samples,
W76-08611 5A

MANSFELD, A.
Radioactivity in the Hydrosphere Recent Trends in Czech Studies,
W76-08627 5A

MARCY, B. C. JR.
Vulnerability and Survival of Young Connecticut River Fish Entrained at a Nuclear Power Plant,
W76-08656 8I

MARINO, M. A.
Dynamic Response of Aquifer Systems to Localized Recharge,
W76-08520 2F

MARRS, R. W.
Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

MARSH, K.
Plutonium Radionuclides in the Groundwaters at Enewetak Atoll,
W76-08607 5B

MARTIN, J. M.
The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

MARTINEC, J.
Snowmelt-Runoff Model for Stream Flow Forecasts,
W76-08131 2E

MARWEDE, M. E.
Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 1-5 MGD Plants, Plants for High Product Recovery,
W76-08118 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 3-25 MGD Low Pressure Plants,
W76-08119 3A

Engineering and Economic Study of Reverse Osmosis Sea Water Desalting Plants, Design of 1-10 MGD Seawater Plants,
W76-08284 3A

MATHESON, D. H.
Water Quality Criteria for Great Lakes Waters to be Used as Municipal and Industrial Water Supplies,
W76-08363 5D

MATHEW, E.
Plutonium in the Aquatic Environment, Its Behaviour, Distribution and Significance,
W76-08599 5C

MATHIAS, E. L.
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

MATHRE, O. B.
A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

MATSUDA, R. I.
Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

MATSUK, V. E.
Some Characteristics of Fat Metabolism in Two Forms of Char Salvelinus Alpinus (L.) From Lake Azabach (Kamchatka), (In Russian),
W76-08310 2H

MATSUO, Y.
A New Sewage Treatment Technique for the Purpose of Nitrogen Elimination (I): Biological Denitrogenization of Urban Sewage (Chisso jokyo o mokuteki to shite atarashii gesui shori gijutsu (I),--Toshi gesui kara no seibutsugakuteki datsu chissoho ni tsuite),
W76-08274 5D

MATTICE, J. S.
Chemistry and Effects of Chlorine in Aquatic Systems, A Selected, Annotated Bibliography,
W76-08592 5C

MATTISON, R. J.
Fiber Recovery Increases Water Re-Use, Reduces Treatment Cost,
W76-08489 5D

MAULDIN, A. F.
Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

MAY, H. T.
A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

MAYER, T.
Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

MAYLAND, H. F.
Alternative Methods of Estimating Snow Water Parameters,
W76-08259 2C

MAYO, R. D.
Conventional Fish Screening Systems and Some Promising Alternatives,
W76-08655 8I

MCCAVE, I. N.
A Physical Model for the Rate of Deposition of Fine-Grained Sediments in the Deep Sea,
W76-08736 2J

MCCLOSKEY, E. W.
Irrigation Signalling Device,
W76-08196 3F

MCCONNELL, J. B.
Data on Selected Lakes in Washington, Part 3,
W76-08564 2H

Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

MCDONALD, D. B.
Coralville Water Quality Study, Annual Report, Water Year October 1, 1974 to September 30, 1975,
W76-08324 5A

MCDONALD, M. P.
Coralville Water Quality Study, Annual Report, Water Year October 1, 1974 to September 30, 1975,
W76-08324 5A

MCDONNELL, A. J.
Use of Crushed Limestone to Neutralize Acid Wastes,
W76-08225 5G

MCGINNESS, J.
ERTS-1 Investigation of Wetlands Ecology,
W76-08319 2L

MCGINNIS, D. F.
Evaluation of ERTS Data for Certain Hydrological Uses,
W76-08147 7C

MCGREEVY, L. J.
Selected Hydrologic Data, Chester County, Pennsylvania,
W76-08557 7C

MCGUINNESS, W. V. JR.
Guidelines for Material Placement in Marsh Creation,
W76-08325 5G

MCILROY, R. A.
The Control of Chloride Ions in the MgO Recovery System,
W76-08457 5D

MCKIM, H. L.
Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

MCLAREN, A. D.
Nitrate Reduction and Associated Microbial Populations in a Ponded Hanford Sandy Loam,
W76-08546 5G

MCLAUGHLIN, D.
A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

MCMILLAN, M. C.
Evaluation of ERTS Data for Certain Hydrological Uses,
W76-08147 7C

MCMINN, J. W.
First-Year Water Yield Increase After Forest Cutting: An Alternative Model,
W76-08362 4C

MCNALLAN, M. J.
High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

MCNAMARA, J. R.
An Optimization Model for Regional Water Quality Management,
W76-08104 5G

MEADOWS, J. W. T.
Procedure for Plutonium Analysis of Large (100 g) Soil and Sediment Samples,
W76-08613 5A

MEE, T. R.
Research and Development of an Airborne Hygroscopic Spray System,
W76-08111 3B

MEEHAN, W. R.
Effects of Forest Fertilization on Two Southeast Alaska Streams,
W76-08673 5B

MEEKS, W.
Entrainment Studies on Hudson River Organisms,
W76-08633 5C

MEHROTRA, S. C.
Some Theoretical Considerations in Reservoir Design,
W76-08518 8B

MEHSHYTHYH, V. V.
Abstract Models of Communities of Aquatic Animals,
W76-08218 8I

Abstract Models of Fish Populations,
W76-08215 8I

Models of Actual Communities,
W76-08219 8I

Models of Actual Fish Populations,
W76-08216 8I

Models of Populations of Aquatic Invertebrates,
W76-08217 8I

Theoretical Bases of Modelling of Populations and Communities of Aquatic Animals,
W76-08214 8I

MEHSHYTKYH, V. V.
Development Trends in Methods used to Model Populations and Communities,
W76-08212 8I

Development Trends in Methods Used to Model Populations and Communities,
W76-08213 8I

MEIER, P. M.
Land-Use Model For Service Area Projection,
W76-08226 5G

MEL'NIKOV, I. A.
Fine-Dispersed Fraction of Suspended Organic Matter in the East Pacific Waters, (In Russian),
W76-08314 5C

MELLON, E. F.
Effect of Flocculants on the Sedimentation of Organic Solids in Tannery Unhairing Effluents,
W76-08164 5D

MELNICK, J. L.
Sterilization of Holding Tanks and Toilet Bowls by Quaternary Compounds,
W76-08201 5D

MENDEL, O.
About the Problem of Direct Runoff Determination by Separation of the Hydrograph Components (K Otazke Urcenia Primaeho Odtoku Separaciou Prietokovych Vln),
W76-08238 2A

MENDOZA, B.
Procedure for Plutonium Analysis of Large (100 g) Soil and Sediment Samples,
W76-08613 5A

MENG, J. C.
Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

MERCER, L. J.
Reassessment of the Cross-Florida Barge Canal: A Probability Approach,
W76-08228 4A

MERCIER, H. T.
A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

MICHALAK, M.
Industrial Waste Treatment System Reduces Pollution,
W76-08711 5D

MIERA, F. R.
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

MIFTAKHUTDINOVA, F. G.
Study of Self-Diffusion of Water and its Activation Energy in Cells of Different Plant Tissues, (In Russian),
W76-08429 2I

MIKULSKI, Z.
The Baltic Sea--A Semi-Enclosed Sea, As Seen by the Hydrologist,
W76-08130 2L

MILES, J. H.
Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

MILGRAM, J. H.
Floating Oil Barrier,
W76-08396 5G

MILLSAPS, C. V.
Zooplankton Studies at Morgantown,
W76-08640 5C

MILLSAPS, H. S. JR.
Zooplankton Studies at Morgantown,
W76-08640 5C

MILNE, M.
Residential Water Conservation,
W76-08103 3D

MISRA, R. D.
Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

MITCHELL, D. M.
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

MITCHELL, N. T.
Environmental and Public Health Consequences of the Controlled Disposal of Transuranic Elements to the Marine Environment,
W76-08604 5C

MIYAKE, Y.
The Plutonium Content of Pacific Ocean Waters,
W76-08601 5C

MIZUFUNE, M.
Elimination Method for Mercury Residue in Water (Suichu yozon suigin no jokyoho),
W76-08476 5D

MIZUMURA, K.
Simulation of Hydraulic Processes in Open Channels,
W76-08344 8B

MOHANRAO, G. J.
Effluent Treatment in Selected Organic Chemical Factories,
W76-08465 5D

MOLDENHAUER, W. C.
Watershed Soil Detachment and Transportation Factors,
W76-08551 2J

MONEY, C. A.
Recycling of Lime-Sulphide Unhairing Liquors - I, Small-Scale Trials,
W76-08179 5D

MOORE, R. P.
Liquid Conditioning and Settling Tanks,
W76-08203 5D

MORGAN, G. M. JR.
Design of an Experiment to Suppress Hail in Illinois,
W76-08330 3B

MORGAN, R. P. II
Biochemical Studies of Entrained Phytoplankton at the Morgantown Maryland Power Plant,
W76-08642 5C

MORGAN, W. D.
Reassessment of the Cross-Florida Barge Canal: A Probability Approach,
W76-08228 4A

MORGELI, B.
Biological Processes for Effluent and Waste Treatment Exemplified by the Paper Industry (Biologische Verfahren Zur Abwasser- Und Abfallaufbereitung am Beispiel der Paper-Industrie),
W76-08699 5D

MORIN, O. J. JR.
Commercial Membrane Desalting Plants: Data and Analysis,
W76-08370 3A

MORRIS, G. L.
Duck-Processing Waste,
W76-08168 3E

MOUNTFORD, K.
Laboratory Simulation of Power Plant Effects: Response of Some Estuarine Phytoplankters to Time Temperature Combinations,
W76-08646 5C

MUDRI, S. S.
Effluent Treatment in Selected Organic Chemical Factories,
W76-08465 5D

MUELLER, E. W.
Effects of Forest Fertilization on Two Southeast Alaska Streams,
W76-08673 5B

MUELLER, J. C.
Detoxification of Bleached Kraft Mill Effluents,
W76-08461 5D

Foam Detoxification of Bleached Kraft Effluent,
W76-08460 5D

MUENCH, R. D.
Oceanographic Conditions During 1973 in Russel Fjord, Alaska,
W76-08525 2L

MUKHEISIN, A. A.
Age Composition and Growth of Aspius Aspius (L.) in the Lower Volga, (In Russian),
W76-08255 2I

MULDER, D.
Drain Envelope Response to Field Treatments,
W76-08548 4A

MULFORD, R. A.
Morgantown Entrainment. Part IV. Phytoplankton Taxonomic Studies,
W76-08643 5C

MULLEN, R. S.
Laboratory Simulation of Power Plant Effects: Response of Some Estuarine Phytoplankters to Time Temperature Combinations,
W76-08646 5C

MULLER, G.
Re-Use and Disposal of Waste Acids,
W76-08721 5D

MULLER, P.
A Parametric Wave Prediction Model,
W76-08337 2L

MUNGLE, C. R.
Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

MUNROE, V. G.
Kraft Effluent Treatment by Flotation,
W76-08463 5D

MURAKAMI, K.
The Effluent Treatment System and Utilization of Recycled Water in the Iyomishima Mill (Daio seishi Mishima kojo ni okeru sogo haisui shori to haisui no sairiyo),
W76-08700 5D

MURDOCH, M. B.
Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

MURPHY, T. P.
Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

MURRAY, C. N.
Results of Plutonium Intercalibration in Seawater and Seaweed Samples,
W76-08616 5A

MUSICK, J. T.
Deep Tillage of Graded-Furrow-Irrigated Pullman Clay Loam,
W76-08543 3F

Limited Irrigation of Grain Sorghum in Alternating Strips with Wheat,
W76-08542 3F

NAFTEL, W. L.
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

NAGASUBRAMANIAN, M. R.
Rainfall and Floods in India During 1974 Southwest Monsoon Period,
W76-08732 2B

NAGHSKI, J.
Alternatives for Reducing Water Pollution in Cattlehide Processing and Tanning,
W76-08285 3E

NAKAYA, H.
Measurement Method for Dissolved Ammonia Nitrogen in Water (Yozon anmoniasei chisso nodo sokuteiho),
W76-08261 5A

NANEY, J. W.
On-Site Runoff Depletion at Three Impoundments,
W76-08122 4A

NARASIMHAN, T. N.
An Integrated Finite Difference Method for Analyzing Fluid Flow in Porous Media,
W76-08123 2F

NARAYANAN, A. S.
Soil Loss from Illinois Farms - Economic Analysis of Productivity Loss and Sedimentation Damage,
W76-08533 4D

NAYAK, I. V.
How Much Precipitation Goes to Infiltration During a Storm Period,
W76-08339 2A

NEGREA, A.
Cladocera and Gastropoda Population Ecology in the Danube Flood Plain, (In Romanian),
W76-08308 2H

NEGREA, ST.
Cladocera and Gastropoda Population Ecology in the Danube Flood Plain, (In Romanian),
W76-08308 2H

NELSON, D. M.
Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

NELSON, D. W.
Determination of Total Nitrogen in Natural Waters,
W76-08355 2K

Evaluation of Methods for Preserving the Levels of Soluble Inorganic Phosphorus and Nitrogen in Unfiltered Water Samples,
W76-08157 5A

NELSON, I. D.
Irrigation System Management for Reducing Peak Electrical Demands,
W76-08549 3F

NELSON, L. M.
Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

NETTLES, M. E.
Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

NEWTON, S. G.
The Use of Likelihood Functions to Fit Conceptual Models with More than One Dependent Variable,
W76-08729 2G

NG, K. S.
Foam Detoxification of Bleached Kraft Effluent,
W76-08460 5D

NIKOL'SKII, G. V.
Role of Far Eastern Herbivorous Fish in Ecosystems of Natural Water Bodies Used for Acclimatization, (In Russian),
W76-08666 5C

NOE, L. A.
Biochemical Studies of Entrained Phytoplankton at the Morgantown Maryland Power Plant,
W76-08642 5C

NORRIS, R. A.
Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

NORTON, D. C.
Eastern Lake Ontario Precipitation Network,
W76-08412 2B

NOSHKIM, V. E.
Plutonium Radionuclides in the Groundwaters at Enewetak Atoll,
W76-08607 5B

NOVAK, L. T.
Phosphorus Movement in Soils: Soil-Orthophosphate Reaction Kinetics,
W76-08672 5B

NOVOZHILOVA, M. I.
Abundance and Biomass of Bacterioplankton of 'Tastaka' Ponds, (In Russian),
W76-08664 5C

NRIAGU, J. O.
Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

NYHAN, J. W.
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

O'CONNELL, P. F.
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W76-08108 4C

O'HEARN, J. P.
Development of Storm Drainage Cost Functions,
W76-08227 3D

O'LEARY, K. J.
Method for Treating Sewage Water,
W76-08394 5D

OBERTEUFFER, J. A.
High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

OGANESYAN, G. A.
Rearing the Sevan Trout at the Aigerlich Trout Pond Fishery, (In Armenian),
W76-08371 2I

OKUDA, T.
A Continuous Method of Monitoring Water Quality by Chlorine Consumption Under Ultraviolet Radiation. I. Design and Performance Test of Continuous Chlorine Consumption Meter and Application to Raw Waters of A Water Purification Plant, (In Japanese),
W76-08276 5A

OLUFEAGBA, B. J.
Shooting Models for Salinity and Coliform,
W76-08134 5B

ONGLEY, E. D.
Sediment Yields and Nutrient Loadings from Canadian Watersheds Tributary to Lake Erie: An Overview,
W76-08529 5B

ONSTAD, C. A.
Watershed Soil Detachment and Transportation Factors,
W76-08551 2J

OPALATENKO, L. K.
Age Composition and Growth of Aspius Aspius (L.) in the Lower Volga, (In Russian),
W76-08255 2I

ORLANDINI, K. A.
Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

ORLOB, G. T.
A Conceptual Representation of the New York Bight Ecosystem,
W76-08411 5B

OSDOR, A.
Method and Apparatus for Drying Moisture-Containing Solids, Particularly Domestic Refuse and Sludge Cakes,
W76-08404 5D

OSSIANDER, F. J.
Fish Diversion Systems and Biological Investigation of Horizontal Traveling Screen Model VII,
W76-08648 8I

OSTAPLYUK, E. D.
Carbohydrate Transformation in Wheat and Rye Plants Under Effect of Flooding in the Autumn-Winter Period, (In Russian),
W76-08307 3F

OSTER, J. D.
Calculated Drainage Water Compositions and Salt Burdens Resulting from Irrigation with River Waters in the Western United States,
W76-08671 5B
Water Quality in Irrigated Watersheds,
W76-08679 5B

OSTREM, G.
Evaluation of Glacier Mass Balance by Observing Variations in Transient Snowline Positions,
W76-08322 2C

OVENSHINE, A. T.
The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

PAGAN, A. R.
Half-Section Pipe Used Effectively,
W76-08237 8F

PAGE, N. R.
The Influence of Soils and Plant Cover on the Retention and Utilization of Suspended and Dissolved Materials in the Waste Water of a Poultry Processing Plant,
W76-08287 5D

PAILY, P. P.
Numerical Prediction of Thermal-Regime of Rivers,
W76-08739 5B

PAITCHELL, H.
Safeguard Fluid-Handling Equipment with Pipeline Basket Strainers,
W76-08235 8G

PAL, D.
Coanda Effect Oil-Water Separator,
W76-08209 5G

PAL, N.
Nonlinear Earthquake Response of Concrete Gravity Dams,
W76-08426 8F

PAN'KOV, E. A.
Decontamination of Wastewaters at the Stage of Potassium Arabonate in the Production of Vitamin B2, (In Russian),
W76-08578 5D

PARKER, C. L.
Fluoride Removal: Technology and Cost Estimates,
W76-08703 5D

PARKER-JONES, H. A.
Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

PASZYC, A. J.
Coanda Effect Oil-Water Separator,
W76-08209 5G

PATRICK, F. M.
Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

PAUDRAT, A.
Electrolytic Purification of Trade Effluents Containing Toxic Materials,
W76-08709 5D

PAULSON, W. L.
Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

PEARSON, C. E.
Computation of Tidal Flow in Well-Mixed Estuaries,
W76-08741 2L

PEARSON, F. H.
Use of Crushed Limestone to Neutralize Acid Wastes,
W76-08225 5G

PEARSON, G. A.
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

PECK, B. B.
Summary of Entrainment Research at the Millstone Point Nuclear Power Station, 1970 to 1972,
W76-08632 5C

PECK, J. V.
Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

PENTEATH, R. J.
Environmental and Public Health Consequences of the Controlled Disposal of Transuranic Elements to the Marine Environment,
W76-08604 5C

PEQUIGNOT, J.
Toxic Action of Copper on the Gills of Carp (Cyprinus Carpio), (In French),
W76-08260 5C

PERKINS, L. Z.
Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

PETERS, R. J.
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

PETERSON, R. J.
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

PETTYJOHN, W. A.
Ground Water Flow No Longer a Mystery,
W76-08114 2F

PFEIFFER, W. J.
Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

PFUDERER, H. A.
Chemistry and Effects of Chlorine in Aquatic Systems, A Selected, Annotated Bibliography,
W76-08592 5C

PHELPS, V. A.
Fast Current Oil Control Study,
W76-08748 5G

PICKETT, D. E.
Canadian Milling Practice for Water Re-Use,
W76-08272 5D

PICKUP, G.
Effects of Hydrologic Regime on Magnitude and Frequency of Dominant Discharge,
W76-08514 2E

PIERSON, W. J.
The Theory and Applications of Ocean Wave Measuring Systems at and Below the Sea Sur-

face, on the Land, from Aircraft, and from Spacecraft,
W76-08145 7B

PILLAI, K. C.
Determination of Plutonium in the Marine Environment,
W76-08615 5A

Plutonium in the Aquatic Environment, Its Behaviour, Distribution and Significance,
W76-08599 5C

Radioruthenium in Coastal Waters,
W76-08619 5A

PILTZ, F. M.
The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

PITMAN, E. H.
Water Treatment Untouched by Human Hands - Almost,
W76-08266 5F

PITTER, P.
Determination of Biological Degradability of Organic Substances,
W76-08351 5B

PITTS, F. H.
Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

PLITMAN, S. I.
Drinking Water Purification in Industrially Manufactured Compact Installations of the Type 'Struya', (In English),
W76-08579 5F

POATS, F. J.
Alternatives for Reducing Water Pollution in Cattlehide Processing and Tanning,
W76-08285 3E

POLEVSHCHIKOV, V. I.
Sulphuric Acid Containing Rinses, Purification,
W76-08506 5D

POLOVTSEV, O. P.
Hygienic Substantiation of the Possibility of Wastewater Treatment of Poultry Processing Plants on Underground Filter Beds, (In Russian),
W76-08581 5D

PORGES, R.
Wastes from the Poultry Processing Industry,
W76-08292 3E

PRAKASH, A.
Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

PRATT, P. F.
Rate of Chloride and Water Movement in Southern California Soils,
W76-08545 2G

Water Quality in Irrigated Watersheds,
W76-08679 5B

PRENTICE, E. F.
Fish Diversion Systems and Biological Investigation of Horizontal Traveling Screen Model VII,
W76-08648 8I

Mechanical Operation of Horizontal Traveling Screen Model VII,
W76-08649 8I

Vertical Traveling Fish Basket Collector,
W76-08650 8I

PROCTOR, R.
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

PROUSE, N. J.
Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

PRUITT, W. O.
Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

PULLEN, E. J.
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

PUNTENNEY, J. L.
Fast Replacement of a Flood-Damaged Interceptor,
W76-08240 8F

RADCENKO, I.
Drainage Runoff of the Groundwater Unsteady Flow to the Drains (Drenazny Odtok Pri Neustalenom Prudeni Podzemnej Vody K Drenom),
W76-08239 4B

RAJAGOPALAN, K.
Methane Fermentation of Rubber (Hevea Brasiliensis) Latex Effluent,
W76-08722 5D

RAMSEY, R. H.
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

RANDALL, J. M.
Removing Heavy Metal Ions from Water,
W76-08401 5D

RANGANNA, G.
How Much Precipitation Goes to Infiltration During a Storm Period,
W76-08339 2A

RAO, T. S. S.
Distribution of Chaetognatha and Biomass of the Zooplankton in the Western Part of the Tropical Atlantic, During July and August 1968, (In Spanish),
W76-08245 2L

Ecology of the Zooplankton in the Gulf of Cariaco. Part I: Variability of the Biomass of the Zooplankton During the Period from August to November, 1973, (In Spanish),
W76-08247 5C

RAPP, J. B.
Amino Acids and Gases in Some Springs and an Oil Field in California,
W76-08568 4B

RASIN, V. J. JR.
Biochemical Studies of Entrained Phytoplankton at the Morgantown Maryland Power Plant,
W76-08642 5C

RAZMAEV, I. I.
Relation Between Plant Transpiration and Metabolism, (In Russian),
W76-08583 2D

REEBURGH, W. S.
Oceanographic Conditions During 1973 in Russel Fjord, Alaska,
W76-08525 2L

REED, L. E.
Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

Environmental Monitoring from Spacecraft Data,
W76-08532 5A

REESE, D. L.
Alternative Methods of Estimating Snow Water Parameters,
W76-08259 2C

REEVE, C. A.
Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

REEVES, J. M.
Detection of Salts of 2,4-D in Aqueous Solution by Laser Raman Spectroscopy,
W76-08254 5A

REID, R. O.
Dense Effluent Dispersion in a Stream,
W76-08316 5B

REIMOLD, R. J.
Chlorinated Hydrocarbon Pesticides and Mercury in Coastal Biota, Puerto Rico and the U.S. Virgin Islands--1972-74,
W76-08683 5B

Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

REISH, D. J.
The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

REULE, C. A.
Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

REUTSKI, U. H.
Soil Moisture Regime and Pigment Content in Leaves of Cereals, (In Belorussian),
W76-08304 3F

REUTSKI, U. R.
Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

REYNOLDS, S. A.
Interaction of Plutonium with Complexing Substances in Soils and Natural Waters,
W76-08605 5B

RHOADES, J. D.
Calculated Drainage Water Compositions and Salt Burdens Resulting from Irrigation with River Waters in the Western United States,
W76-08671 5B

Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

Water Quality in Irrigated Watersheds,
W76-08679 5B

RICHARDS, B. G.
Earth Pressure Observations on a Retaining Wall in Expansive Clay, Gougher Street Mail Exchange, Adelaide,
W76-08424 8D

RICHARDS, K. S.
Complex Width-Discharge Relations in Natural River Sections,
W76-08735 2E

RICHARDS, R. T.
Perforated-Pipe Water Intake for Fish Protection,
W76-08137 8I

RICHARDSON, J. L.
Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

ROBINSON, K. S.
The Role of High Rate Bio-Filters in the Leather Industry,
W76-08180 5D

ROGERS, C. A.
Effects of Temperature and Salinity on the Survival of Winter Flounder Embryos,
W76-08437 5C

ROGERS, C. J.
Recycling of Water in Poultry Processing Plants,
W76-08298 3E

ROGERS, R. H.
Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

Environmental Monitoring from Spacecraft Data,
W76-08532 5A

ROGERS, R. N.
Modular Water Filter,
W76-08210 5F

ROLLAG, D. A.
Egg-Processing Plant Wastes,
W76-08170 3E

ROMANENKO, V. I.
Process for Purification of Industrial Waste Waters from Perchlorates and Chlorates,
W76-08395 5D

ROMANKEVICH, E. A.
Organic Carbon, Phosphorus and Nitrogen in the Waters of the Sea of Japan, (In Russian),
W76-08313 5A

ROMANOVSKII, Y. E.
Method of Studying the Spatial Distribution of Organisms, (In Russian),
W76-08176 7B

ROODE, M. C.
Energy Content of the Benthos and Epifauna in the Pongola River, Natal, (In Afrikaans),
W76-08158 2I

ROSEN, G. D.
Protein and Fat Recovery from Effluents,
W76-08172 5D

ROSENBERG, E.
Cleaning of Cargo Compartments,
W76-08198 5G

ROSENBERG, N. J.
Canopy Temperature Measurement of Sorghum and Millet with Leaf Thermocouple and Infrared Thermometer Techniques,
W76-08590 2D

Comparison of a Modified Brown-Rosenberg Resistance Model with other Evapotranspiration Estimation Methods: Tests in an Irrigated Sorghum Field,
W76-08589 2D

Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

Resistance-Mass Transfer Method for Estimating Evapotranspiration: Comparison with Lysimetric Measurements in Irrigated Sorghum,
W76-08588 2D

Thermal Scanner Measurements of Crop Temperatures to Estimate Evapotranspiration,
W76-08591 2D

ROSS, D. B.
A Parametric Wave Prediction Model,
W76-08337 2L

ROTT, E.
Biological Problems of a Manmade Small Lake, (In German),
W76-08107 5C

RUBER, H.
The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

RUSSELL, K. C.
High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

RYABOV, F. P.
Phytoplankton in Northern Donetsk Ponds for Additional Treatment, (In Ukranian),
W76-08577 5C

SAAR, M. O.
Modular Water Filter,
W76-08210 5F

SAFHAY, M.
Oxygen, and Other Innovations, Help Lick Tough Waste Problem,
W76-08715 5D

SAKKAS, J. G.
Dimensionless Solution of Dam-Break Flood Waves,
W76-08343 8B

SAVERY, C. W.
Momentum Transfer in Hydrodynamically Developing Laminar Flow in a Straight Channel,
W76-08318 8B

SAVRANSKAYA, T. M.
Study of the Effectiveness of Removing Heavy Metals in Biological Purification of Municipal Sewage, (In Russian),
W76-08580 5D

SAYER, W. L.
Method for Locating and Evaluating Geothermal Sources of Energy by Sensing Electrostatic Voltage Gradients,
W76-08204 4B

SAYLOR, J. H.
Measurements of Current Flow During Summer in Lake Huron,
W76-08413 2H

Water Volume Transport and Oscillatory Current Flow Through the Straits of Mackinac,
W76-08128 2H

SAZONAVA, L. S.
Soil Moisture Regime and Pigment Content in Leaves of Cereals, (In Belorussian),
W76-08304 3F

SCHALEKAMP, M.
The Water Supply System of a Large Urban Agglomeration in Switzerland (Die Wasserversowgung Einer Schweizerischen Gross-Agglomeration),
W76-08233 5F

SCHELL, I. I.
On a Thermal Lag in the North Atlantic Ocean During a Climatic Change,
W76-08127 2L

SCHELLENBERG, H. D.
Identification, Measurement, and Incorporation of Environmental Quality Objectives in Natural Resource Development,
W76-08101 6B

SCHINDEWOLF, U.
Process for the Environmentally Favorable Destruction of Solid and/or Liquid Cyanide Waste,
W76-08208 5D

SCHMISSEUR, W. E.
Economic Evaluation of Proposed Water Conservation Practices on Established Irrigation Districts: A General Methodology and Application to Three Districts in Oregon,
W76-08431 3F

SCHNEIDER, D. L.
A Procedure for Analysis of Amercium in Marine Environmental Samples,
W76-08611 5A

SCHOLTZ, A. T.
Experimental Confirmation of the Olfactory Hypothesis with Homing, Artificially Imprinted Coho Salmon (Oncorhynchus Kisutch),
W76-08439 5C

SCHOOF, R. R.
On-Site Runoff Depletion at Three Impoundments,
W76-08122 4A

SCHROEDER, P. J.
Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 1-5 MGD Plants, Plants for High Product Recovery,
W76-08118 3A

Engineering and Economic Study of Reverse Osmosis Brackish Water Desalting Plants, Design of 3-25 MGD Low Pressure Plants,
W76-08119 3A

Engineering and Economic Study of Reverse Osmosis Sea Water Desalting Plants, Design of 1-10 MGD Seawater Plants,
W76-08284 3A

SCHULER, V. J.
Experimental Studies in Guiding Marine Fishes of Southern California with Screens and Louvers,
W76-08659 8I

SCHULTS, D. W.
A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

SCHULTZ, J. R.
Egg-Processing Plant Wastes,
W76-08170 3E

SCHUMACHER, J. D.
A Seabed Drifter Study of Near-Bottom Circulation in North Carolina Shelf Waters,
W76-08350 2L

SCHWAB, G. O.
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

SCHWARTZ, H. F.
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

SCHWEIGER, J. S.
Procedure for Plutonium Analysis of Large (100 g) Soil and Sediment Samples,
W76-08613 5A

SCOTT, B. F.
Behaviour of Oil Under Canadian Climatic Conditions. Part 1. Oil on Water Under Ice-Forming Conditions,
W76-08365 5B

Effect of Crude Oil on Populations of Bacteria and Algae in Artificial Ponds Subject to Winter Weather and Ice Formation,
W76-08453 5C

SEDOVA, V. A.
Efficient Chemical Method for the Treatment of Zinc Manufacturing Plant Generated Waste Waters (Effektivnyy khimicheskikh sposob ochistki stochnykh vod tsinkovogo zavoda),
W76-08268 5D

SEE, J. B.
High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

SEIFERT, W. J. JR
Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

SELL, W.
A Parametric Wave Prediction Model,
W76-08337 2L

SEMENYUK, V. E.
Carbohydrate Transformation in Wheat and Rye Plants Under Effect of Fiooding in the Autumn-Winter Period, (In Russian),
W76-08307 3F

SERGUNINA, L. A.
Drinking Water Purification in Industrially Manufactured Compact Installations of the Type 'Struya', (In English),
W76-08579 5F

SEVERN, D. J.
Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

SHAH, K. R.
Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

SHAH, N. J.
Environmental Monitoring from Spacecraft Data,
W76-08532 5A

SHANKS, M. H.
Interaction of Plutonium with Complexing Substances in Soils and Natural Waters,
W76-08605 5B

SHELDON, R. B.
Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

SHELPUK, C.
Mercury Concentrations in Fish, North Atlantic Offshore Waters--1971,
W76-08360 5A

SHERMAN, R. M.
Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

SHEW, D. C.
Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

SHIDELER, G. L.
Field Performance of Permeable Breakwater,
W76-08684 8A

SHIFRIN, S.
Cleaning of Industrial Effluent,
W76-08719 5D

SHIMOKAWA, M.
Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

SHINDLER, D. B.
Effect of Crude Oil on Populations of Bacteria and Algae in Artificial Ponds Subject to Winter Weather and Ice Formation,
W76-08453 5C

SHIOZAKI, M.
Methods of Ruthenium 106 Analysis in Marine Environmental Samples, - A Review,
W76-08617 5A

SHIPPEN, R. S.
Laboratory Simulation of Power Plant Effects: Response of Some Estuarine Phytoplankters to Time Temperature Combinations,
W76-08646 5C

SHNIER, C.
The Influence of Water Quality on Accumulation of Heavy Metals in Aquatic Organisms,
W76-08456 5C

SIFALDA, V.
Derivation of a Model Rain for the Dimensioning of Sewer Systems (Entwicklung eines Berechnungsregens fuer die Bemessung von Kanalnetzen),
W76-08253 5D

SIMCO, B. A.
Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

SIMONS, T. J.
Continuous Dynamical Computations of Water Transports in Lake Erie for 1970,
W76-08724 2H

Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

SINGH, K. S.
A Comparative Study of the Effect of Qualities of Irrigation Water on Different Soils,
W76-08301 3C

SINGH, U. P.
Preliminary Hydrologic Design of Small Flood Detention Reservoirs,
W76-08731 8B

SISK, M. E.
An Aquatic Technique for Collecting Small Adult Insects,
W76-08574 7B

SKINNER, J. E.
A Functional Evaluation of a Large Louver Screen Installation and Fish Facilities Research on California Water Diversion Projects,
W76-08652 8I

SLONOV, L. K.
Change of the Content and State of Pigments in Leaves of Male and Female Hemp in Relation to Nutrition and Soil Moisture Content, (In Russian),
W76-08306 2I

SLOSS, P. W.
Measurements of Current Flow During Summer in Lake Huron,
W76-08413 2H

Water Volume Transport and Oscillatory Current Flow Through the Straits of Mackinac,
W76-08128 2H

SLOTO, R. A.
Selected Hydrologic Data, Chester County, Pennsylvania,
W76-08557 7C

SLY, P. G.
Lake Erie and Its Basin,
W76-08723 2H

SMAYDA, T. J.
Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

SMETACEK, V.
The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

SMIRNOV, V. V.
Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

SMITH, D. F.
Natural and Agricultural Ecosystems,
W76-08667 6G

SMITH, K.
Water Temperature Variations Within a Major River System,
W76-08340 2E

SMITH, K. V. H.
Channel Flow Over Permeable Beds of Graded Spheres,
W76-08511 8B

SMITH, R. A.
Effects of Condenser Destruction of Algae on Dissolved Oxygen Levels in the James River,
W76-08638 5C

Effects of Condenser Entrainment on Algal Photosynthesis at Mid-Atlantic Power Plants,
W76-08637 5C

Entrainment of Planktonic Organisms into Cooling Water Systems of Three Mid-Atlantic Thermal Power Plants,
W76-08635 5C

SMITH, R. E.
Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

SMITH, V. E.
Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

SMOLYAK, L. P.
Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

Soil Moisture Regime and Pigment Content in Leaves of Cereals, (In Belorussian),
W76-08304 3F

SMUROV, A. V.
Method of Studying the Spatial Distribution of Organisms, (In Russian),
W76-08176 7B

SNYDER, W. M.
A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

SODERQUIST, M. R.
Water Pollution Abatement Technology: Costs and Capabilities, Canned and Preserved Fruits and Vegetables,
W76-08187 5G

SOKOL, R. A.
The Responses of Soils and Soil Microorganisms to Silver Iodide Weather Modification Agents,
W76-08670 2G

SOMMERFELDT, T. G.
Outflow from Various Subsurface Drainage Materials,
W76-08669 4A

SOMMERS, L. E.
Determination of Total Nitrogen in Natural Waters,
W76-08355 2K

SPATZ, D. D.
Reverse Osmosis System Corrects High BOD Wastes: Yields Net Operating Savings,
W76-08486 5D

SPENCER, J. R.
Drain Envelope Response to Field Treatments,
W76-08548 4A

SPIESMAN, M.
Note on the Distribution of Mercury in Fish Species in Three Ohio Lakes,
W76-08441 5C

STAFFORD, D. B.
Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

STAHL, U.
Apparatus for Continuous Dewatering of Aqueous Suspensions,
W76-08202 5D

STANFORD, G.
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

STEADMAN, J. R.
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

STEIN, R. M.
Design and Performance of Physical-Chemical and Activated Sludge Treatment for an Edible Oil Plant,
W76-08293 5D

STETSON, L. E.
Irrigation System Management for Reducing Peak Electrical Demands,
W76-08549 3F

STEWART, J. I.
Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

STOBER, Q. J.
A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part I: Model Studies and Fouling Control Techniques,
W76-08660 8I

STOKES, P.
Uptake and Accumulation of Copper and Nickel by Metal Tolerant Strains of Scenedesmus,
W76-08452 5C

STOLBOV, D. I.
Drinking Water Purification in Industrially Manufactured Compact Installations of the Type 'Struya', (In English),
W76-08579 5F

STONE, H. W.
Libby, McNeill Solves an Odor Problem,
W76-08502 5D

STONE, R.
Procedure for Plutonium Analysis of Large (100 g) Soil and Sediment Samples,
W76-08613 5A

STRANDBERG, H. V.
A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part II: Design Concept,
W76-08661 8I

STRASKRABOVA, V.
Self-Purification Capacity of Impoundments,
W76-08358 5C

STRAWN, K.
Numbers of Individuals and Injury Rates of Fishes Caught on Revolving Screens at the P. H. Robinson Generating Station,
W76-08653 8I

STRELKOFF, T.
Dimensionless Solution of Dam-Break Flood Waves,
W76-08343 8B

STRUZESKI, E. J.
Wastes from the Poultry Processing Industry,
W76-08292 3E

SUBRAHMANYAM, C. B.
Studies on the Animal Communities in Two North Florida Salt Marshes. Part I. Fish Communities,
W76-08161 2L

SUBRAHMANYAM, P. V. R.
Effluent Treatment in Selected Organic Chemical Factories,
W76-08465 5D

SUCHECKI, S. M.
Canton's Futuristic Waste Treatment System,
W76-08720 5D

SUDO, R.
Food Habit of Vorticellidae Isolated From Activated Sludge,
W76-08309 5D

SUGAWARA, K.
A Study on Marine Trace Elements and CSK Standards, (In Japanese),
W76-08311 2L

SUGIMURA, Y.
The Plutonium Content of Pacific Ocean Waters,
W76-08601 5C

SULLIVAN, R. H.
An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

SUPP, A.
Studies Concerning Oil Removal from Mill Scale (Untersuchungen Zur Entoelung Von Walzzunder),
W76-08707 5D

SUTCLIFFE JR, W. H.
Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

SUZUKI, T.
A New Sewage Treatment Technique for the Purpose of Nitrogen Elimination (I): Biological Denitrogenization of Urban Sewage (Chisso jokyo o mokuteki to shite atarashii gesui shori gijutsu (I),--Toshi gesui kara no seibutsugakuteki datsu chissoho ni tsuite),
W76-08274 5D

SWANSON, C. L.
Removal of Heavy Metal Ions from Wastewater,
W76-08402 5D

SWANSON, E. R.
Soil Loss from Illinois Farms - Economic Analysis of Productivity Loss and Sedimentation Damage,
W76-08533 4D

SWEAZY, R. M.
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

SWIERKOWSKI, P. B.
A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part I: Model Studies and Fouling Control Techniques,
W76-08660 8I

SWIFT, S. A.
A Physical Model for the Rate of Deposition of Fine-Grained Sediments in the Deep Sea,
W76-08736 2J

SZEKELY, F.
Estimation by Digital Computer of the Drawdown Caused by Groundwater Withdrawal,
W76-08140 4B

SZUMIEC, M.
The Effect of Controlled Eutrophication on Solar Radiation Penetrating into Ponds, (In Polish),
W76-08305 5C

TABACHNIKOV, V. I.
Apparatus for Pumping Oil-Water Mixture from a Collection Vessel of a Floating Oil Collector into Settling Tanks,
W76-08403 5G

TACHIBANA, M.
Sessile Animals on Tar Globules in the Waters Around the Ryukyu Islands, (In Japanese),
W76-08232 2L

TAMATE, T.
Measurement Method for Dissolved Ammonia Nitrogen in Water (Yozon anmoniasei chisso nodo sokuteiho),
W76-08261 5A

TAYLOR, D.
The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

TAYLOR, O. J.
Artificial-Recharge Experiments in the Alluvial Aquifer South of Fountain, El Paso County, Colorado,
W76-08571 4B

TERICH, T. A.
Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

TERSKOV, I. A.
Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

THAKORE, A. N.
Toxic Constituents in Pulp Mill Effluents,
W76-08458 5A

THEILIG, G.
Re-Use and Disposal of Waste Acids,
W76-08721 5D

THEUS, H. P.
Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

THOMAS, A. W.
A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

THOMAS, J. F.
Method and Apparatus for the Destructive Decomposition of Organic Wastes Without Air Pollution and With Recovery of Chemical Byproducts,
W76-08459 5D

THOMAS, R. L.
Cultural Impact on the Geochemistry of Sediments in Lake Erie,
W76-08727 2J

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

Surficial Sediments of Lake Erie,
W76-08725 2J

THOMPSON, G. H.
Evaluation of Mineralization Processes for SRP Wastes,
W76-08595 5G

THOMPSON, N. P.
Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

THOMPSON, R. G.
What Does a 'Clean' Environment Cost,
W76-08150 5G

THORUD, D. B.
Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

TIEFENBRUNNER, F.
Biological Problems of a Manmade Small Lake, (In German),
W76-08107 5C

TIKHONOV, I. F.
Settling Tank,
W76-08495 5D

TIRRELL, C. E.
Process for the Electrolytic Reclamation of Spent Etching Fluids,
W76-08471 5D

TOMITA, A.
Measurement Method for Dissolved Ammonia Nitrogen in Water (Yozon anmoniasei chisso nodo sokuteiho),
W76-08261 5A

TOYA, Y.
A New Sewage Treatment Technique for the Purpose of Nitrogen Elimination (I): Biological Denitrogenization of Urban Sewage (Chisso jokyo o mokuteki to shite atarashii gesui shori gijutsu (I),--Toshi gesui kara no seibutsugakuteki datsu chissoho ni tsuite),
W76-08274 5D

TRENT, L.
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

TRIPATHI, R. P.
Thermal Properties of Fine Textured Mollisols Under Varying Moisture Conditions,
W76-08364 2G

TULLOCK, R. J.
Rate of Chloride and Water Movement in Southern California Soils,
W76-08545 2G

UHLMANN, D.
Introduction to Hydrobiology. Hydrobiology: A Compendium for Engineers and Natural Scientists, (In German),
W76-08315 5C

UROSA, L. J.
Distribution of Chaetognatha and Biomass of the Zooplankton in the Western Part of the Tropical Atlantic, During July and August 1968, (In Spanish),
W76-08245 2L

Ecology of the Zooplankton in the Gulf of Cariaco. Part I: Variability of the Biomass of the Zooplankton During the Period from August to November, 1973, (In Spanish),
W76-08247 5C

VACELOET, E.
Role of Vitamins in Bacterial-Plankton Relationships in Littoral Seawater and in Supralit-

toral Pools: II. Annual Evolution of Organisms Which Produce Vitamin Synthesis, (In French),
W76-08405 5C

VAGANOV, E. A.
Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

VAN DER KAMP, G.
Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case,
W76-08124 2F

VAN GENUCHTEN, M. T.
Transfer of Boron and Tritiated Water Through Sandstone,
W76-08547 5B

VAN HYLCKAMA, T. E. A.
Water Use by Saltcedar as Measured by the Water Budget Method,
W76-08573 2D

VAN MEER, A. J. J.
Recent Investigations into the Disposal of Tannery Waste Water,
W76-08183 5D

Trivalent Chromium in Tannery Effluents,
W76-08295 5D

VAN VLIMMEREN, P. J.
Recent Investigations into the Disposal of Tannery Waste Water,
W76-08183 5D

VAUGHT, K.
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Brazoria, Fort Bend, and Waller Counties, Texas, 1966-74,
W76-08569 4B

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Harris and Galveston Counties, Texas, 1970-74,
W76-08570 4B

VEITH, G. D.
Baseline Concentrations of Polychlorinated Biphenyls and DDT in Lake Michigan Fish, 1971,
W76-08685 5A

VELCHEK, H. L.
Quality Control in Radiochemical Analysis,
W76-08609 5A

VELIKANOV, G. A.
Study of Self-Diffusion of Water and its Activation Energy in Cells of Different Plant Tissues, (In Russian),
W76-08429 2I

VERMA, S. B.
Comparison of a Modified Brown-Rosenberg Resistance Model with other Evapotranspiration Estimation Methods: Tests in an Irrigated Sorghum Field,
W76-08589 2D

Resistance-Energy Balance Method for Predicting Evapotranspiration: Determination of Boundary Layer Resistance and Evaluation of Error Effects,
W76-08586 2D

Resistance-Mass Transfer Method for Estimating Evapotranspiration: Comparison with Lysimetric Measurements in Irrigated Sorghum,
W76-08588 2D

VOLZ, M. G.
Nitrate Reduction and Associated Microbial Populations in a Ponded Hanford Sandy Loam,
W76-08546 5G

VON BODUNGEN, B.
The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

VON BROCKEL, K.
The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

VONBODUNGEN, B.
The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

VONBROCKEL, K.
The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

VORONOV, J. V.
Process for Purification of Industrial Waste Waters from Perchlorates and Chlorates,
W76-08395 5D

WAGNER, J. H.
Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

WAHLGREN, M. A.
Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

WAISS, A. C. JR.
Removing Heavy Metal Ions from Water,
W76-08401 5D

WALDEN, C. C.
Detoxification of Bleached Kraft Mill Effluents,
W76-08461 5D

Foam Detoxification of Bleached Kraft Effluent,
W76-08460 5D

WALDROP, W. R.
Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

WALLER, W. T.
Entrainment Studies on Hudson River Organisms,
W76-08633 5C

WALLIS, C.
Sterilization of Holding Tanks and Toilet Bowls by Quaternary Compounds,
W76-08201 5D

WALSH, T.
Design and Performance of Physical-Chemical and Activated Sludge Treatment for an Edible Oil Plant,
W76-08293 5D

WALTER, R. H.
Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

WARNER, R. F.
Effects of Hydrologic Regime on Magnitude and Frequency of Dominant Discharge,
W76-08514 2E

WATTS, D. G.
Irrigation System Management for Reducing Peak Electrical Demands,
W76-08549 3F

WAYTENICK, R. J.
Cooperation Helps Erie,
W76-08481 5D

WEBB, M.
The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

WEISS, C. M.
Response of Phytoplankton to Thermal Stress,
W76-08644 5C

WEISS, J. S.
Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

WEISS, P.
Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

WEISS, W. R.
Chlorinated Hydrocarbons in Mesopelagic Fishes of the Eastern Gulf of Mexico,
W76-08434 5C

WELBY, C. W.
Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

WELLS, D. M.
Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III - Volume 1--Dry Weather Flows,
W76-08278 5B

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 2, Impacts of Dust Storms,
W76-08279 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

WELLS, M. R.
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

WENZLOFF, D.
Mercury Concentrations in Fish, North Atlantic Offshore Waters--1971,
W76-08360 5A

WHISLER, F. D.
Calculating the Unsaturated Hydraulic Conductivity and Diffusivity,
W76-08142 2G

WHITMORE, C. M.
Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

WICKHAM, D. E.
Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

WIERENGA, P. J.
Transfer of Boron and Tritiated Water Through Sandstone,
W76-08547 5B

WIESNET, D. R.
Evaluation of ERTS Data for Certain Hydrological Uses,
W76-08147 7C

WILKINSON, B. H. P.
Acid Coagulation and Dissolved Air Flotation,
W76-08224 5D

WILLARDSON, L. S.
Drain Envelope Response to Field Treatments,
W76-08548 4A

WILLIAMS, B. J.
Two-Dimensional Mathematical Water Quality Model,
W76-08135 5B

WILLIAMS, G.
Application of the National Weather Service Flash-Flood Program in the Western Region,
W76-08415 4A

WILLIAMS, J. D. H.
Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

WILLIAMS, R. H.
Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

WILLIAMS-WYNN, D. A.
No-Effluent Tannery Processes,
W76-08182 3E

WILLIS, R.
Transient Water Quality Modeling in Streams,
W76-08730 5B

WILSON, A. L.
Absorptiometric Determination of Iron with T.P.T.Z.,
W76-08273 5A

WILSON, C. L.
Environmental Monitoring from Spacecraft Data,
W76-08532 5A

WILSON, C. R.
Flow Interference Effects at Fracture Intersections,
W76-08335 2F

WING, R. E.
Removal of Heavy Metal Ions from Wastewater,
W76-08402 5D

WINTER, D. F.
Computation of Tidal Flow in Well-Mixed Estuaries,
W76-08741 2L

WIRTENAN, L.
Preliminary Studies on the Effects of Air Bubbles and Intense Illumination on the Swimming Behavior of the Striped Bass (Morone Saxitalis) and the Gizzard Shad (Dorosoma Cepedianum),
W76-08658 8I

WISCHMEIER, W. H.
Use and Misuse of the Universal Soil Loss Equation,
W76-08120 2J

WITHEROW, J. L.
Paunch Handling and Processing Techniques,
W76-08173 3E

WITHERSPOON, F. G. JR.
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

WITHERSPOON, P. A.
Flow Interference Effects at Fracture Intersections,
W76-08335 2F

An Integrated Finite Difference Method for Analyzing Fluid Flow in Porous Media,
W76-08123 2F

WLODEK, S.
A Rapid Method for the Determination of Radioiodine in Suspended Matter and Seawater,
W76-08623 5A

WONG-CHONG, G. M.
The Kinetics of Microbial Nitrification,
W76-08369 5D

WONG, K. M.
Plutonium Radionuclides in the Groundwaters at Enewetak Atoll,
W76-08607 5B

WOOD, G.
An Assessment of Eutrophication in Australian Inland Waters,
W76-08162 5C

WOOD, G. F.
A Modified Raw-Wool Scouring System for Easier Effluent Treatment,
W76-08717 5D

WOODHEAD, D. S.
Environmental and Public Health Consequences of the Controlled Disposal of Transuranic Elements to the Marine Environment,
W76-08604 5C

WOOLNER, L. E.
A Study of the Stability of Some Radionuclides in Seawater,
W76-08625 5A

WORD, J. Q.
The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

WRIGHT, P.
Method for Locating and Evaluating Geothermal Sources of Energy by Sensing Electrostatic Voltage Gradients,
W76-08204 4B

WRIGHT, W. W.
Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

WYCOFF, R. L.
Preliminary Hydrologic Design of Small Flood Detention Reservoirs,
W76-08731 8B

WYLIE, E. B.
Transient Aquifer Flows by Characteristics Method,
W76-08513 2F

YAGISHITA, A.
Plating Waste Recovery Unit,
W76-08478 5D

YAMAZAKI, Y.
Simultaneous Determination of Cu2+, Pb2+, Cd2+, and Zn2+ in Fresh Town-Water by Anodic Stripping Polargraphy, (In Japanese),
W76-08275 5A

YANNOPOULOS, C.
Marine Ecology of the Northern Euboea: I. Preliminary Data on the Zooplankton and the Ichtyoplankton, (In French),
W76-08106 2L

YEH, G. T.
Three-Dimensional Pollutant Modeling in Shear Flow,
W76-08740 5B

YORGEY, W. B.
Updating an Existing Pollution Control Facility at Western Electric,
W76-08477 5D

YOUNG, D-L.
Steady Stratified Circulation in a Cavity,
W76-08136 2H

ZAGNI, A. F. E.
Channel Flow Over Permeable Beds of Graded Spheres,
W76-08511 8B

ZEIGLER, E. R.
Hydraulic Model Vortex Study-Grand Coulee Third Powerplant,
W76-08113 8B

ZEITSCHEL, B.
The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

ZERMAN, P. J.
Nitrogen and Phosphorus Losses from Winter Disposal of Dairy Manure,
W76-08159 5C

ZHELEZNYAK, M. I.
Dissipation of Turbulent Energy in a Natural Channel,
W76-08744 8B

ZIEMBA, J. V.
Libby, McNeill Solves an Odor Problem,
W76-08502 5D

ZIMMERMANN, K.
Studies Concerning Oil Removal from Mill Scale (Untersuchungen Zur Entoelung Von Walzzunder),
W76-08707 5D

ZLOTNIKOV, A. B.
Cleaning of Industrial Effluent,
W76-08719 5D

ZOTEEVA, N. F.
Decontamination of Wastewaters at the Stage of Potassium Arabonate in the Production of Vitamin B2, (In Russian),
W76-08578 5D

ZUBCHENKO, I. A.
Ecology and Prospects of Using the Amphipod Gammarus (R.) Balcanicus Schaef, (In Russian),
W76-08410 2I

ORGANIZATIONAL INDEX

ACADEMY OF MUNICIPAL ECONOMY, MOSCOW (USSR). RESEARCH INST. OF PUBLIC WATER SUPPLY, WATER PURIFICATION.
Drinking Water Purification in Industrially Manufactured Compact Installations of the Type 'Struya', (In English),
W76-08579 5F

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, PA.
Laboratory Simulation of Power Plant Effects: Response of Some Estuarine Phytoplankters to Time Temperature Combinations,
W76-08646 5C

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, PA. DEPT. OF LIMNOLOGY.
Savannah River Biological Survey, Lower Three Runs.
W76-08593 5C

Savannah River Biological Survey.
W76-08594 5C

ACRES CONSULTING SERVICES LTD., NIAGARA FALLS (ONTARIO).
The Halton-Wentworth Waterfront Study, Volume 1, Concepts for Waterfront Development (Summary).
W76-08382 6B

AEROJET-GENERAL CORP., EL MONTE, CALIF. (ASSIGNEE).
Solid Mineral and Regenerant Recovery for Ion-Exchange Resins,
W76-08199 3A

AGRICULTURAL RESEARCH COUNCIL, LANGFORD (ENGLAND). MEAT RESEARCH INST.
Utilisation of Blood,
W76-08166 3E

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. HYDROGRAPH LAB.
An Optimization Technique Adapted to USDAHL-74 Revised Model of Watershed Hydrology,
W76-08523 2A

AGRICULTURAL RESEARCH SERVICE, BRAWLEY, CALIF. IMPERIAL VALLEY CONSERVATION RESEARCH CENTER.
Salt and Water Balance in Imperial Valley, California,
W76-08331 3C

Drain Envelope Response to Field Treatments,
W76-08548 4A

AGRICULTURAL RESEARCH SERVICE, CHICKASHA, OKLA.
On-Site Runoff Depletion at Three Impoundments,
W76-08122 4A

AGRICULTURAL RESEARCH SERVICE, CHICKASHA, OKLA. SOUTHERN GREAT PLAINS WATERSHED RESEARCH CENTER.
Investigation of Use of Space Data in Watershed Hydrology,
W76-08326 4A

AGRICULTURAL RESEARCH SERVICE, FORT COLLINS, COLO.
Eutrophication of Microponds,
W76-08354 5C

AGRICULTURAL RESEARCH SERVICE, LINCOLN, NEBR.
Irrigation System Management for Reducing Peak Electrical Demands,
W76-08549 3F

AGRICULTURAL RESEARCH SERVICE, MORGANTOWN, W. VA.
Nitrogen Conservation Under Corn Planted in Quackgrass Sod,
W76-08541 3F

AGRICULTURAL RESEARCH SERVICE, MORRIS, MINN.
Watershed Soil Detachment and Transportation Factors,
W76-08551 2J

AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.
Infiltration into Increasingly Permeable Soils,
W76-08516 2G

AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SALINITY LAB.
Calculated Drainage Water Compositions and Salt Burdens Resulting from Irrigation with River Waters in the Western United States,
W76-08671 5B

AGRICULTURAL RESEARCH SERVICE, SIDNEY, MON.
Estimating Water Salinity with Geophysical Earth Resistivity Equipment,
W76-08332 2K

AGRICULTURAL RESEARCH SERVICE, WATKINSONVILLE, GA.
A Model for Runoff of Pesticides from Small Upland Watersheds,
W76-08356 5B

AIR AND WATER RESEARCH, INC., GAINESVILLE, FLA.
Entrainment Studies at Turkey Point on Biscayne Bay: Have Thermal Effects Affected the Plankton of Biscayne Bay,
W76-08645 5C

AIR LIQUIDES SOCIETE ANONYME POUR ET L'EXPLOITATION DES PROCEDES, PARIS (FRANCE). (ASSIGNEE).
Purification of Effluent,
W76-08206 5D

AIR PREHEATER CO., INC., WELLSVILLE, N. Y. (ASSIGNEE).
Metallic Recovery System,
W76-08493 5D

AIX-MARSEILLE-UNIV. (FRANCE). LABORATOIRE D'HYDROBIOLOGIE.
Planktonic Ecosystems: The Effects of Dystrophic Conditions on Structure and Function in the Gulf of Fos, (In French),
W76-08312 5C

AKADEMIYA NAUK SSSR, MOSCOW. INSSTITUT OKEANOLOGII.
Fine-Dispersed Fraction of Suspended Organic Matter in the East Pacific Waters, (In Russian),
W76-08314 5C

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT OKEANOLOGII.
Organic Carbon, Phosphorus and Nitrogen in the Waters of the Sea of Japan, (In Russian),
W76-08313 5A

AKADEMIYA NAUK URSR, KIEV. INSTITUT FIZIOLOGII RASTENII I AGROKHIMII.
Carbohydrate Transformation in Wheat and Rye Plants Under Effect of Flooding in the Autumn-Winter Period, (In Russian),
W76-08307 3F

AKADEMIYA NAUK URSR, KIEV. INSTYTUT HYDROBIOLOGII.
A Brief Characterization of Shoals and Their Plant Cover in the Kremenchug Reservoir, (In Russian),
W76-08697 2H

AKADEMIYA NAVUK BSSR, MINSK. INSR. OF EXPERIMENTAL BOTANY.
Soil Moisture Regime and Pigment Content in Leaves of Cereals, (In Belorussian),
W76-08304 3F

AKADEMIYA NAVUK BSSR, MINSK. INST. OF EXPERIMENTAL BOTANY.
Role of Groundwaters in Redistribution of Solar Radiation by a Phytocenosis, (In Belorussian),
W76-08665 2I

ALABAMA UNIV., DEPT. OF CHEMICAL AND METALLURGICAL ENGINEERING.
Water Resources Planning for Rivers Draining into Mobile Bay, Part II: Non-Conservative Species Transport Models,
W76-08327 5B

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
Oceanographic Conditions During 1973 in Russel Fjord, Alaska,
W76-08525 2L

The Nitrogen Balance of Arctic Tundra: Pathways, Rates, and Environmental Implications,
W76-08678 5B

ALL-UNION SCIENTIFIC RESEARCH INST. FOR VITAMINS, MOSCOW (USSR),
Decontamination of Wastewaters at the Stage of Potassium Arabonate in the Production of Vitamin B2, (In Russian),
W76-08578 5D

ALWATECH A. S., OSLO (NORWAY).
Protein and Fat Recovery from Effluents,
W76-08172 5D

AMERICAN PUBLIC WORKS ASSOCIATION, CHICAGO, ILL.
An Analysis of U. S. Environmental Protection Agency's Needs Survey,
W76-08195 5G

AMERICAN UNIV., WASHINGTON, D.C. DEPT. OF BIOLOGY.
ERTS-1 Investigation of Wetlands Ecology,
W76-08319 2L

AMOCO PRODUCTION CO., TULSA, OKLA.
Solution for Radial-Flow with Nonlinear Adsorption,
W76-08345 5B

ANDERSON CLAYTON FOODS, INC., SHERMAN, TEX.
Water-Recycle Washing of Refined Soybean Oil: Plant Scale Evaluation,
W76-08171 3E

ARAGO LAB., BANYULS-SUR-MER (FRANCE).
Energy Transfer in Sedimentary Environments: The Case of Sulfatoreducers: I. The Organic

ARAGO LAB., BANYULS-SUR-MER (FRANCE).

Acids in Lagoon and Marine Sediments (Golfe du Lion), (In French),
W76-08718 5C

ARGONNE NATIONAL LAB. ILL.

Study of the Behaviour of Transuranics and Possible Chemical Homologues in Lake Michigan Water and Biota,
W76-08598 5C

Plutonium and Americium in Lake Michigan Sediments,
W76-08606 5C

ARIZONA UNIV., TUCSON. DEPT. OF CIVIL ENGINEERING AND ENGINEERING MECHANICS.

Soil Stabilization with Powdered and Coarse Quicklime,
W76-08422 8D

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.

Water Yield Improvement by Vegetation Management: Focus on Arizona,
W76-08539 3B

ARMY ENGINEER DISTRICT, ALBUQUERQUE, N. MEX.

Flood Plain Information: Purgatoire River and Tributaries, Vicinity of Trinidad, Colorado.
W76-08381 4A

Special Flood Hazard Information: Arkansas River and Tributaries, Great Bend, Kansas, to John Martin Dam, Colorado.
W76-08388 4A

ARMY ENGINEER DISTRICT, LOS ANGELES, CALIF.

Flood Plain Information: San Antonio Creek and Tributaries, Vicinity of OJAI, Ventura County, California.
W76-08380 4A

ARMY ENGINEER DISTRICT, SACRAMENTO, CALIF.

Flood Plain Information: Alamo and Ulatis Creeks, Vacaville, California.
W76-08377 4A

Flood Plain Information: Colorado River and Rifle, Government, Hubbard Gulch Creeks, Rifle, Colorado.
W76-08390 4A

ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF.

Flood Plain Information: San Felipe Lake, Unit 2, San Benito, California.
W76-08376 4A

Flood Plain Information: Eel River--Stafford to Holmes, Humboldt County, California,
W76-08378 4A

Flood Plain Information: San Felipe Lake, Pacheco Creek, San Benito County, California.
W76-08379 4A

ARMY ENGINEER DISTRICT, VICKSBURG, MISS.

Flood Plain Information: Saline River and Tributaries, Benton, Arkansas.
W76-08389 4A

ARMY ENGINEER DIV. NORTH PACIFIC, BONNEVILLE, OREG. DIV. HYDRAULIC LAB.

Intake Manifolds and Emptying Valves for Lower Monumental Lock, Snake River, Washington,
W76-08146 8C

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.

Improvement of Core Drill Methods,
W76-08419 8D

Properties of Expansive Clay Soils; Report 2, A Numerical Procedure for Predicting Heave with Time,
W76-08420 8D

ASSOCIATED WATER AND AIR RESOURCES ENGINEERS, INC., NASHVILLE, TENN.

Design and Performance of Physical-Chemical and Activated Sludge Treatment for an Edible Oil Plant,
W76-08293 5D

ATHENS UNIV. (GREECE). ZOOLOGICAL LAB. AND MUSEUM.

Marine Ecology of the Northern Euboea: I. Preliminary Data on the Zooplankton and the Ichtyoplankton, (In French),
W76-08106 2L

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL (ENGLAND).

Ultrasonic River Flow Measurement,
W76-08241 7B

Use of Surface-Active Chemicals in Pump-Ashore Schemes and Suction Dredgers,
W76-08747 8C

AZOVSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT RYBNOGO KHOZYAISTVA, ROSTOV-NA-DONU (USSR).

Biological Background of the New Element of Sturgeon Artificial Rearing Methods, (In Russian),
W76-08663 8I

B. C. RESEARCH LTD., VANCOUVER.

Toxic Constituents in Pulp Mill Effluents,
W76-08458 5A

Foam Detoxification of Bleached Kraft Effluent,
W76-08460 5D

Detoxification of Bleached Kraft Mill Effluents,
W76-08461 5D

BABCOCK AND WILCOX CO., ALLIANCE, OHIO. RESEARCH AND DEVELOPMENT CENTER.

The Control of Chloride Ions in the MgO Recovery System,
W76-08457 5D

BANGLADESH AGRICULTURAL UNIV., MYMENSINGH. FACULTY OF FISHERIES.

An Experiment on the Feeding of Fry of Catfish Heteropneustes Fossilis,
W76-08575 2I

BAYLOR COLL. OF MEDICINE, HOUSTON, TEX. (ASSIGNEE).

Sterilization of Holding Tanks and Toilet Bowls by Quaternary Compounds,
W76-08201 5D

BECHTEL CORP., SAN FRANCISCO, CALIF.

Some Theoretical Considerations in Reservoir Design,
W76-08518 8B

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA). MARINE ECOLOGY LAB.

Coastal Circulation and Physical Oceanography of the Scotian Shelf and the Gulf of Maine,
W76-08125 2L

Effects of Low Concentrations of Oil Accommodated in Sea Water on the Growth of Unialgal Marine Phytoplankton Cultures,
W76-08440 5C

BENDIX AEROSPACE SYSTEMS DIV., ANN ARBOR, MICH.

Environmental Monitoring from Spacecraft Data,
W76-08532 5A

Computer Mapping of Turbidity and Circulation Patterns in Saginaw Bay, Michigan from Landsat Data,
W76-08746 5B

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA). HEALTH PHYSICS DIV.

Plutonium in the Aquatic Environment, Its Behaviour, Distribution and Significance,
W76-08599 5C

Determination of Plutonium in the Marine Environment,
W76-08615 5A

Radioruthenium in Coastal Waters,
W76-08619 5A

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.

Improved Image-Well Technique for Aquifer Analysis,
W76-08517 4B

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF MATHEMATICAL STATISTICS.

A Reconsideration of the Fiering Two-Station Model,
W76-08519 4A

BLACK, CROW AND EIDSNESS, INC., GAINESVILLE, FLA.

Water Treatment Untouched by Human Hands - Almost,
W76-08266 5F

Preliminary Hydrologic Design of Small Flood Detention Reservoirs,
W76-08731 8B

BLACK, CROW AND EIDSNESS, IND., ATLANTA, GA.; AND JORDAN, JONES AND GOULDING, INC. ATLANTA, GA.

Water Pollution Abatement Technology: Capabilities and Costs, Urban Runoff.
W76-08222 5G

BROOKHAVEN NATIONAL LAB., UPTON, NEW YORK, DEPT. OF APPLIED SCIENCE.

Land-Use Model For Service Area Projection,
W76-08226 5G

BULGARIAN ACADEMY OF SCIENCES, SOFIA. INST. OF BOTANY.

Dependence of Stomatal Number and Size in Juglans Regia L. on Ecological Conditions, (In Bulgarian),
W76-08668 2I

BUREAU OF RECLAMATION, DENVER, COLO.

Planning Irrigation and Drainage Systems Using Retention and Extraction Limits,
W76-08553 3F

BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.

Load and Voltage Control Algorithms for Grand Coulee Powerplant,
W76-08112 8C

Hydraulic Model Vortex Study-Grand Coulee Third Powerplant,
W76-08113 8B

Desalting Handbook for Planners.
W76-08584 3A

BURNS AND ROE, INC., HEMPSTEAD, N. Y.
Perforated-Pipe Water Intake for Fish Protection,
W76-08137 8I

CALIFORNIA STATE DEPT. OF FISH AND GAME, STOCKTON.
A Functional Evaluation of a Large Louver Screen Installation and Fish Facilities Research on California Water Diversion Projects,
W76-08652 8I

CALIFORNIA STATE DEPT. OF FISH AND GAME, STOCKTON. DELTA FISH AND WILDLIFE STUDY.
Entrainment and Thermal Effects on a Mysid Shrimp and Striped Bass in the Sacramento-San Joaquin Delta,
W76-08631 5C

CALIFORNIA STATE UNIV., LONG BEACH.
The Effect of Heavy Metals on Laboratory Populations of Two Polychaetes with Comparisons to the Water Quality Conditions and Standards in Southern California Marine Waters,
W76-08451 5C

CALIFORNIA UNIV., BERKELEY. (ASSIGNEE).
Method and Apparatus for the Destructive Decomposition of Organic Wastes Without Air Pollution and With Recovery of Chemical Byproducts,
W76-08459 5D

CALIFORNIA UNIV., BERKELEY. DEPT. OF CIVIL ENGINEERING.
An Integrated Finite Difference Method for Analyzing Fluid Flow in Porous Media,
W76-08123 2F

CALIFORNIA UNIV., BERKELEY. DEPT. OF SOILS AND PLANT NUTRITION.
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W76-08546 5G

CALIFORNIA UNIV., BERKELEY. EARTHQUAKE ENGINEERING RESEARCH CENTER.
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W76-08426 8F

CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
Fundamental Aspects of Erosion of Cohesive Soils,
W76-08540 2J

CALIFORNIA UNIV., DAVIS. DEPT. OF FOOD SCIENCE AND TECHNOLOGY.
Mortalities and Epibiotic Fouling of Eggs from Wild Populations of the Dungeness Crab, Cancer Magister,
W76-08444 5C

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.
Irrigating Corn and Grain Sorghum with a Deficient Water Supply,
W76-08544 3F

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
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W76-08607 5B

Isotopic Analysis of Plutonium in Environmental Samples by Isotope Dilution Mass Spectrometry,
W76-08612 5A

Procedure for Plutonium Analysis of Large (100 g) Soil and Sediment Samples,
W76-08613 5A

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ARCHITECTURE AND URBAN PLANNING.
Residential Water Conservation,
W76-08103 3D

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AGRICULTURAL ENGINEERING.
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W76-08679 5B

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
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W76-08545 2G

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF ECONOMICS.
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W76-08228 4A

CAMPBELL SOUP CO., CAMDEN, N. J.
Spray Irrigation of Polutry Processing Wastewater,
W76-08165 5D

CAMPBELL SOUP CO., CAMDEN, N. J. ENVIRONMENTAL ENGINEERING DEPT.
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W76-08468 5E

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
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W76-08363 5D

Mercury in the Surficial Sediments of Lake Erie,
W76-08526 5B

Forms of Phosphorus in the Surficial Sediments of Lake Erie,
W76-08527 5B

Forms of Iron and Manganese in Lake Erie Waters,
W76-08528 5B

Numerical Computations of Advective and Diffusive Transports of Chloride in Lake Erie, 1970,
W76-08530 5B

Computations of Physical Transport and Regeneration of Phosphorus in Lake Erie, Fall 1970,
W76-08531 5B

Lake Erie and Its Basin,
W76-08723 2H

Continuous Dynamical Computations of Water Transports in Lake Erie for 1970,
W76-08724 2H

Surficial Sediments of Lake Erie,
W76-08725 2J

Rates of Accumulation of Phosphorus Forms in Lake Erie Sediments,
W76-08726 2J

Cultural Impact on the Geochemistry of Sediments in Lake Erie,
W76-08727 2J

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO. DEPT. OF EARTH SCIENCES.
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W76-08441 5C

CATALYTIC INC., PHILADELPHIA, PA.
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W76-08188 5G

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W76-08189 5G

Field Evaluation Testing of Reverse Osmosis High Pressure Pumps and Energy Recovery Turbines.
W76-08372 3A

CENTER FOR ENVIRONMENT AND MAN, INC., HARTFORD, CONN.
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W76-08325 5G

CENTRAL LAB. FOR RADIOLOGICAL PROTECTION, WARSAW (POLAND).
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W76-08623 5A

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W76-08465 5D

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W76-08405 5C

CENTRO DI RICERCA IBM DI VENEZIA (ITALY).
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W76-08333 2F

CESKOSLOVENSKA AKADEMIE VED, PRAGUE. HYDROBIOLOGICKA LABORATOR.
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W76-08358 5C

CHERNE INDUSTRIAL, INCORPORATED, EDINA, MINN. (ASSIGNEE).
Combination Sewage Treatment and Cooling System,
W76-08242 5D

CHILE UNIV., SANTIAGO. CENTRO DE RECURSOS HIDRAULICOS.
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W76-08520 2F

CHRYSLER CORP. SYRACUSE, N. Y. NEW PROCESS GEAR DIV.
Pollution Problem Solver,
W76-08483 5D

CINCINNATI UNIV., OHIO. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Treatment of Tannery Wastewater from Bona Allen, Inc., Buford, Georgia,
W76-08177 5D

CINCINNATI UNIV., OHIO. TANNERS' COUNCIL LAB.
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W76-08174 5D

CITY COLL., NEW YORK. DEPT. OF MATHEMATICS.
Infiltration Analysis and Perturbation Methods 1. Absorption with Exponential Diffusivity,
W76-08334 2G

CITY UNIV. OF NEW YORK. INST. OF OCEANOGRAPHY.
The Theory and Applications of Ocean Wave Measuring Systems at and Below the Sea Surface, on the Land, from Aircraft, and from Spacecraft,
W76-08145 7B

CLEMSON UNIV., S. C. DEPT. OF AGRICULTURAL CHEMICAL SERVICES.
The Influence of Soils and Plant Cover on the Retention and Utilization of Suspended and Dissolved Materials in the Waste Water of a Poultry Processing Plant,
W76-08287 5D

CLEMSON UNIV., S. C. DEPT. OF CIVIL ENGINEERING.
Measuring Watershed Land-Use Changes with Airphotos,
W76-08229 7B

CLEVELAND STATE UNIV., OHIO. DEPT. OF CHEMICAL ENGINEERING.
Phosphorus Movement in Soils: Soil-Orthophosphate Reaction Kinetics,
W76-08672 5B

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
Arctic and Subarctic Environmental Analyses Utilizing ERTS-1 Imagery,
W76-08510 2C

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H. APPLIED RESEARCH BRANCH.
Arching of Fragmented Ice Covers,
W76-08149 2C

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF AGRONOMY.
The Impact of Molybdenum-Enriched Irrigation Water on Agricultural Soils Near Brighton, Colorado,
W76-08675 5B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Development of Storm Drainage Cost Functions,
W76-08227 3D

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W76-08670 2G

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W76-08618 5A

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A Modified Raw-Wool Scouring System for Easier Effluent Treatment,
W76-08717 5D

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Earth Pressure Observations on a Retaining Wall in Expansive Clay, Gougher Street Mail Exchange, Adelaide,
W76-08424 8D

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Recycling of Lime-Sulphide Unhairing Liquors - I, Small-Scale Trials,
W76-08179 5D

COMPUTERIZED POLLUTION ABATEMENT CORP., LEICESTER, N. Y.
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W76-08472 5D

CONSOLIDATED EDISON CO. OF NEW YORK, INC., NEW YORK. OFFICE OF ENVIRONMENTAL AFFAIRS.
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W76-08657 8I

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W76-08427 8D

COPENHAGEN UNIV. (DENMARK). FRESHWATER BIOLOGICAL LAB.
An Ignition Method for Determination of Total Phosphorus in Lake Sediments,
W76-08346 5A

CORNELL UNIV., ITHACA, N.Y. DEPT. OF AGRONOMY.
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W76-08159 5C

Oxygen Relationships in a Soil Treated with Sewage Effluent,
W76-08231 5D

CORNELL UNIV., ITHACA, N. Y. DEPT. OF CIVIL AND AGRICULTURAL ENGINEERING.
Land Use and Water Quality in New York Rivers,
W76-08133 5B

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W76-08136 2H

Transient Water Quality Modeling in Streams,
W76-08730 5B

CORPS OF ENGINEERS, WALTHAM, MASS. NEW ENGLAND DIV.
The Use of ERTS Imagery in Reservoir Management and Operation,
W76-08537 4A

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Nitrogen Utilization During Spring Blooms of Marine Phytoplankton in Bedford Basin, Nova Scotia, Canada,
W76-08691 5C

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Radiochemical Determination of Plutonium in Marine Samples by Ion Exchange and Solvent Extraction,
W76-08614 5A

DEPARTMENT OF AGRICULTURE, LETHBRIDGE (ALBERTA). RESEARCH STATION.
Outflow from Various Subsurface Drainage Materials,
W76-08669 4A

DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C. OFFICE OF THE SECRETARY. (ASSIGNEE).
Removing Heavy Metal Ions from Water,
W76-08401 5D

Removal of Heavy Metal Ions from Wastewater,
W76-08402 5D

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO). MINERAL PROCESSING DIV.
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W76-08272 5D

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W76-08162 5C

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Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case,
W76-08124 2F

Behaviour of Oil Under Canadian Climatic Conditions. Part 1. Oil on Water Under Ice-Forming Conditions,
W76-08365 5B

DEPARTMENT OF THE NAVY, WASHINGTON, D.C.
Particle Vaporizer,
W76-08148 3B

DEUTSCHE GOLD- UND SILBER-SCHEIDEANSTALT A. G., FRANKFURT-AM-MAIN (WEST GERMANY). (ASSIGNEE).
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W76-08208 5D

DEUTSCHES HYDROGRAPHISCHES INSTITUT, HAMBURG (WEST GERMANY).
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W76-08624 5A

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W76-08489 5D

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W76-08318 8B

DSS ENGINEERS, INC., FT. LAUDERDALE, FLORIDA.
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W76-08370 3A

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W76-08329 5B

Evaluation of Mineralization Processes for SRP Wastes,
W76-08595 5G

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W76-08600 5C

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W76-08524 2L

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A Peroxygen System for Destroying Cyanide in Zinc and Cadmium Electroplating Rinse Waters,
W76-08470 5D

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W76-08164 5D

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W76-08210 5F

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W76-08274 5D

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W76-08750 2F

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W76-08681 5D

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W76-08285 3E

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W76-08300 3E

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W76-08536 6B

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W76-08131 2E

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W76-08471 5D

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W76-08187 5G

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W76-08138 2C

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W76-08409 5D

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Cooperation Helps Erie,
W76-08481 5D

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W76-08499 5A

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W76-08161 2L

FLORIDA UNIV., FORT PIERCE. INST. OF FOOD AND AGRICULTURAL SCIENCE.
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W76-08680 5B

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W76-08118 3A

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W76-08119 3A

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W76-08284 3A

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W76-08362 4C

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W76-08108 4C

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W76-08109 4A

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W76-08110 4A

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W76-08430 4A

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W76-08175 5D

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W76-08559 2J

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W76-08569 4B

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W76-08570 4B

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W76-08571 4B

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W76-08557 7C

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W76-08558 4A

GEOLOGICAL SURVEY, ITHACA, N.Y.
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W76-08554 2K

GEOLOGICAL SURVEY, LUBBOCK, TEX.
Water Use by Saltcedar as Measured by the Water Budget Method,
W76-08573 2D

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Water Resources Data for California, 1974: Part 1. Surface Water Records--Volume 2: Northern Great Basin and Central Valley.
W76-08556 7C

The Placer River Silt--An Intertidal Deposit Caused by the 1964 Alaska Earthquake,
W76-08560 2J

Distribution and Movement of Zinc and Other Heavy Metals in South San Francisco Bay, California,
W76-08561 5B

Water Quality in the Mad River Basin, Humboldt and Trinity Counties, California,
W76-08562 5A

Amino Acids and Gases in Some Springs and an Oil Field in California,
W76-08568 4B

GEOLOGICAL SURVEY, RESTON, VA.
Interstation Correlation of Peak-Flow Estimates,
W76-08555 4A

Design of Ground-Water Level Observation Network.
W76-08563 4B

GEOLOGICAL SURVEY, TACOMA, WASH.
Data on Selected Lakes in Washington, Part 3,
W76-08564 2H

Reconnaissance Data on Lakes in Washington--Volume 3. Kitsap, Mason, and Pierce Counties,
W76-08565 2H

Reconnaissance Data on Lakes in Washington--Volume 4. Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston Counties,
W76-08566 2H

Reconnaissance Data on Lakes in Washington--Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima Counties,
W76-08567 2H

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
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W76-08572 4A

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W76-08163 9D

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Chlorinated Hydrocarbon Pesticides and Mercury in Coastal Biota, Puerto Rico and the U.S. Virgin Islands--1972-74,
W76-08683 5B

GEORGIA UNIV., EXPERIMENT. DIV. OF FOOD SCIENCES.
Coagulation with Chitosan - An Aid to Recovery of By-Products from Egg Breaking Wastes,
W76-08289 5D

GEORGIA UNIV., SAPELO ISLAND. MARINE INST.
Detritus Production in Coastal Georgia Salt Marshes,
W76-08688 5C

GERAGHTY AND MILLER, INC., PORT WASHINGTON, N.Y.
Water Resources of the World, Selected Statistics.
W76-08507 7C

GESELLSCHAFT FUER KERNFORSCHUNG M.B.H., KARLSRUHE (WEST GERMANY).
Application of the Finite Element Method in Foundation Engineering (Die Anwendung der Methode der Finiten Elemente in der Grundbaupraxis),
W76-08423 8D

GIBBS AND HILL, INC., NEW YORK.
Development of an Overall Economic/Environmental Plan for the Monongahela River Basin.
W76-08387 5C

GIDROMETEOROLOGICHESKII INSTITUT, ODESSA (USSR).
Dissipation of Turbulent Energy in a Natural Channel,
W76-08744 8B

GIFFORD-HILL AND CO., INC., DALLAS, TEX. (ASSIGNEE).
Self Propelled Sprinkling Irrigation Apparatus,
W76-08407 3F

GOLD KIST INC., ATLANTA, GA.
Waste Treatment and Control at Live Oak Poultry Processing Plant,
W76-08185 3E

GOVIND BALLABH PANT UNIV. OF AGRICULTURE AND TECHNOLOGY, PANTNAGAR (INDIA).
Thermal Properties of Fine Textured Mollisols Under Varying Moisture Conditions,
W76-08364 2G

GULF ENVIRONMENTAL SYSTEMS CO., SAN DIEGO, CALIF.
Development of Reverse Osmosis Membranes and Spiral Design Modules for Demineralization of Brackish Waters at Low Pressures,
W76-08373 3A

GUYTON (WILLIAM F.) AND ASSOCIATES, AUSTIN, TEX.
Trickle Irrigation with Water of Different Salinity Levels,
W76-08550 3C

HAMBURG UNIV. (WEST GERMANY). INSTITUT FUER HYDROBIOLOGIE UND FISCHEREIWISSENSCHAFT.
Considerations of Testing the Accumulation of Pesticides by Means of Artificial Food Chains,
W76-08361 5A

HANOVER RESEARCH CORP., EAST HANOVER, N. J. (ASSIGNEE).
Process and Apparatus for Recovering Clean Water From Aqueous Wastes,
W76-08408 5D

HAWAII UNIV., HONOLULU. DEPT. OF AGRICULTURAL ENGINEERING.
The Kinetics of Microbial Nitrification,
W76-08369 5D

HAYWARD MFG., CO., INC., ELIZABETH, N. J.
Safeguard Fluid-Handling Equipment with Pipeline Basket Strainers,
W76-08235 8G

HOESCHST A. G., FRANKFURT AM MAIN (WEST GERMANY).
Re-Use and Disposal of Waste Acids,
W76-08721 5D

HOUSTON UNIV., TEX.
What Does a 'Clean' Environment Cost,
W76-08150 5G

HUMPHREYS (HOWARD) AND SONS, READING (ENGLAND).
Channel Flow Over Permeable Beds of Graded Spheres,
W76-08511 8B

IBM SPACE SYSTEMS CENTER, HUNTSVILLE, ALA.
Implementation of Hydrologic Models at Goddard Space Flight Center.
W76-08745 2A

ICHTHYOLOGICAL ASSOCIATES, INC., MIDDLETON, DEL.
Experimental Studies in Guiding Marine Fishes of Southern California with Screens and Louvers,
W76-08659 8I

ICI UNITED STATES, INC. WILMINGTON, DEL.
Treatment of Dye Wastes with Granular Activated Carbon,
W76-08716 5D

IDAHO UNIV., KIMBERLY. WATER RESOURCES RESEARCH INST.
Alternative Methods of Estimating Snow Water Parameters,
W76-08259 2C

ILLINOIS STATE WATER SURVEY, URBANA.
Design of an Experiment to Suppress Hail in Illinois,
W76-08330 3B

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF AGRICULTURAL ECONOMICS.
Soil Loss from Illinois Farms - Economic Analysis of Productivity Loss and Sedimentation Damage,
W76-08533 4D

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The Acute Toxicity of Dissolved Elemental Phosphorus to Cod (Gadus Morhua),
W76-08450 5C

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND).
Artificially Simulating the Geological History of Clay,
W76-08421 8D

INDIAN OCEAN BIOLOGICAL CENTRE, COCHIN (INDIA); AND NATIONAL INST. OF OCEANOGRAPHY, COCHIN (INDIA).
Ecology of the Zooplankton in the Gulf of Cariaco. Part I: Variability of the Biomass of the Zooplankton During the Period from August to November, 1973, (In Spanish),
W76-08247 5C

INNSBRUCK UNIV. (AUSTRIA). HYGIENISCHES INSTITUT.
Biological Problems of a Manmade Small Lake, (In German),
W76-08107 5C

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Possibility of Determining the Rate of Seasonal Radial Growth of Trunks and Changes in the Water Regime of Trees Using a Photometric Curve, (In Russian),
W76-08521 2I

INSTITUTE FOR WATER RESOURCES (ARMY), FORT BELVOIR, VA.
Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality,
W76-08152 6B

Water Supply.
W76-08153 4A

Water Allocation.
W76-08154 6B

Water Quality.
W76-08155 5G

Control of Acid Mine Drainage.
W76-08156 5G

INSTITUTE NATIONAL DE LIMNOLOGIA, SANTO TOME (ARGENTINA).
New Methods for Ecological Analysis of Microorganisms of Eutrophic Waters, (In Spanish),
W76-08252 5A

INSTITUTE OF HYDROLOGY, WALLINGFORD (ENGLAND).
The Use of Likelihood Functions to Fit Conceptual Models with More than One Dependent Variable,
W76-08729 2G

INSTITUTE OF PUBLIC HEALTH, TOKYO (JAPAN). DEPT. OF RADIOLOGICAL HEALTH.
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W76-08617 5A

INSTITUUT TNO LEDER EN SCHOENEN, WAALWIJK (NETHERLANDS).
Trivalent Chromium in Tannery Effluents,
W76-08295 5D

INSTITUUT TNO VOOR LEDER EN SCHOENEN, WAALWIJK (NETHERLANDS).
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W76-08183 5D

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA).
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W76-08597 5C

INTERNATIONAL CITY MANAGEMENT ASSOCIATION, WASHINGTON, D.C. MANAGEMENT DEVELOPMENT CENTER.
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W76-08692 5D

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Results of Plutonium Intercalibration in Seawater and Seaweed Samples,
W76-08616 5A

Intercalibration of Methods for Radionuclide Measurements on a Seaweed Sample,
W76-08626 5A

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Reference Methods for Marine Radioactivity Studies II.
W76-08608 5A

INTERNATIONAL MILL SERVICE, PHILADELPHIA, PENNSYLVANIA.
Ims-Grangcold Pelletizing System for Steel Mill Wastes Material,
W76-08491 5D

IOWA STATE UNIV., AMES. DEPT. OF ECONOMICS.
Identification, Measurement, and Incorporation of Environmental Quality Objectives in Natural Resource Development,
W76-08101 6B

Efficient Resource Utilization Within a Regional Framework.
W76-08102 6B

IOWA UNIV., IOWA CITY. DEPT. OF CIVIL (ENVIRONMENTAL) ENGINEERING.
Oxidation Ditch Treatment of Meat Packing Wastes,
W76-08223 5D

IOWA UNIV., IOWA CITY. INST. OF HYDRAULIC RESEARCH.
Thermal-Hydraulic Model Study of Offshore Discharge System for Kahe Power Plant, Hawaii,
W76-08508 5B

IOWA UNIVERSITY, IOWA CITY, INST. OF HYDRAULIC RESEARCH.
Coralville Water Quality Study, Annual Report, Water Year October 1, 1974 to September 30, 1975,
W76-08324 5A

JOHN MORRELL AND CO., OTTUMWA, IOWA.
Morrell Pioneers More Efficient Aeration,
W76-08286 5D

JOHNS HOPKINS UNIV., BALTIMORE, MD.
Phytoplankton Entrainment Studies at the Indian River Estuary, Delaware,
W76-08636 5C

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOGRAPHY AND ENVIRONMENTAL ENGINEERING.
Entrainment of Planktonic Organisms into Cooling Water Systems of Three Mid-Atlantic Thermal Power Plants,
W76-08635 5C

Effects of Condenser Entrainment on Algal Photosynthesis at Mid-Atlantic Power Plants,
W76-08637 5C

Effects of Condenser Destruction of Algae on Dissolved Oxygen Levels in the James River,
W76-08638 5C

Entrainment of Zooplankton at Three Mid-Atlantic Power Plants,
W76-08639 5C

KABARDINO-BALKARSKI GOSUDARSTVENNYI UNIVERSITET, NALCHIK (USSR).
Change of the Content and State of Pigments in Leaves of Male and Female Hemp in Relation to Nutrition and Soil Moisture Content, (In Russian),
W76-08306 2I

KANEGAFUCHI KAGAKU KOGYO KABUSHIKI KAISHA, OSAKA (JAPAN). (ASSIGNEE).

KANEGAFUCHI KAGAKU KOGYO KABUSHIKI KAISHA, OSAKA (JAPAN). (ASSIGNEE).
Ion-Exchange Group Bearing Composite Membranes,
W76-08211 3A

KANSAS AGRICULTURAL EXPERIMENT STATION, MANHATTAN. EVAPOTRANSPIRATION LAB.
Great Plains Evapotranspiration by a Resistance Model Using Remotely Sensed Thermal Imagery,
W76-08585 2D

KANSAS STATE UNIV. RESEARCH FOUNDATION, MANHATTAN. (ASSIGNEE).
Demand Bactericide for Disinfecting Water and Process of Preparation,
W76-08391 5D

KARNATAKA REGIONAL ENGINEERING COLLEGE, SURATHAL (INDIA). DEPT. OF MECHANICS AND HYDRAULICS.
How Much Precipitation Goes to Infiltration During a Storm Period,
W76-08339 2A

KASPIISKII NAUCHNO-ISSLEDOVATELSKII INSTITUT RYBNOGO KHOZYAISTVA, ASTRAKHAN (USSR).
Age Composition and Growth of Aspius Aspius (L.) in the Lower Volga, (In Russian),
W76-08255 2I

Ecology and Prospects of Using the Amphipod Gammarus (R.) Balcanicus Schaef, (In Russian),
W76-08410 2I

KAZAN INST. OF BIOLOGY (USSR).
Study of Self-Diffusion of Water and its Activation Energy in Cells of Different Plant Tissues, (In Russian),
W76-08429 2I

KENTUCKY UNIV., LEXINGTON. DEPT. OF ELECTRICAL ENGINEERING.
Detection of Salts of 2,4-D in Aqueous Solution by Laser Raman Spectroscopy,
W76-08254 5A

KIEL UNIV. (WEST GERMANY). INSTITUT FUER MEERESKUNDE.
The Plankton Tower. I. A Structure to Study Water/Sediment Interactions in Enclosed Water Columns,
W76-08446 5C

The Plankton Tower. II. Release of Nutrients from Sediments Due to Changes in the Density of Bottom Water,
W76-08447 5C

KIROV AGRIC. INST., KIROV, USSR.
The State of Water in Plant Tissues at Negative Temperatures under Natural Conditions, (In Russian),
W76-08368 2I

KRAMER, CHIN AND MAYO, INC. SEATTLE, WASH.
Conventional Fish Screening Systems and Some Promising Alternatives,
W76-08655 8I

Development of Biological Design Criteria for Fish Screens and Barriers,
W76-08662 8I

LAB. ECOPHYSIOL. ANIM., UNIV. PAUL-SABATIER, TOULOUSE, FR.
Toxic Action of Copper on the Gills of Carp (Cyprinus Carpio), (In French),
W76-08260 5C

LANCHESTER POLYTECHNIC, COVENTRY (ENGLAND).
Complex Width-Discharge Relations in Natural River Sections,
W76-08735 2E

LANCHESTER POLYTECHNIC, COVENTRY (ENGLAND), DEPT. OF CIVIL ENGINEERING.
Numerical Computation of Two-Dimensional Flows,
W76-08341 2L

LAWLER, MATUSKY AND SKELLY ENGINEERS, TAPPAN, N.Y.
Hudson River Striped Bass Life Cycle Model,
W76-08634 5C

LEEDS, HILL, AND JEWETT, INC., SAN FRANCISCO, CALIF.
Flow Interference Effects at Fracture Intersections,
W76-08335 2F

LEHIGH UNIV. BETHLEHEM, PA. DEPT. OF ECONOMICS.
An Optimization Model for Regional Water Quality Management,
W76-08104 5G

LEHIGH UNIV., BETHLEHEM, PA. INST. FOR PATHOLOGY; AND LEHIGH UNIV., BETHLEHEM, PA. CENTER FOR HEALTH SCIENCES.
Does Copper Cause Anemia in Biomphalaria Glabrata,
W76-08455 5C

LOCKWOOD GREENE ENGINEERS, INC., SPARTANBURG, S. C.
Water Pollution Abatement Technology, Capabilities and Costs, Textile Industry.
W76-08186 5G

LOS ALAMOS SCIENCE LAB., N. MEX.
Distribution of Plutonium in Soil Particle Size Fractions of Liquid Effluent-Receiving Areas at Los Alamos,
W76-08160 5B

LOUISIANA STATE UNIV., BATON ROUGE, DEPT. OF CHEMICAL ENGINEERING.
Development of a Three-Dimensional Time-Dependent Flow Field Model,
W76-08328 2L

LOUISVILLE UNIV., KY. DEPT. OF CIVIL ENGINEERING.
Refuse into Power,
W76-08693 5D

LYNDON B. JOHNSON SCHOOL OF PUBLIC AFFAIRS, AUSTIN, TEX.
Environmental Quality and Inflation: A Regional Perspective on the Cost-Push Impact of the 1972 Pure Water Legislation,
W76-08151 5G

MANGANARO (CHARLES A.), NEW YORK.
Oxygen, and Other Innovations, Help Lick Tough Waste Problem,
W76-08715 5D

MANSFIELD SEWAGE TREATMENT PLANT, OHIO.
'We've Found a Real Time-Saver',
W76-08251 8C

MARYLAND DEPT. OF NATURAL RESOURCES, ANNAPOLIS.
The Cherry Creek-Casselman River Environmental Improvement Plan,
W76-08384 5G

MARYLAND UNIV., SOLOMONS. CHESAPEAKE BIOLOGICAL LAB.
Zooplankton Studies at Morgantown,
W76-08640 5C

The Effects of Entrainment on Phytoplankton at the Morgantown Steam Electric Station, Potomac River Estuary, September 5-8, 1972,
W76-08641 5C

Biochemical Studies of Entrained Phytoplankton at the Morgantown Maryland Power Plant,
W76-08642 5C

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
Stability and Mixing of a Vertical Round Buoyant Jet in Shallow Water,
W76-08144 8B

One-Dimensional Temperature Predictions in Unsteady Flows,
W76-08738 5B

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF MATERIALS SCIENCE AND ENGINEERING.
High-Gradient Magnetic Filtration of Steel Plant Waste Water,
W76-08710 5D

MAX-PLANCK-INSTITUT FUER METEOROLOGIE, HAMBURG (WEST GERMANY).
A Parametric Wave Prediction Model,
W76-08337 2L

MEAT INDUSTRY RESEARCH INST., WELLINGTON, (NEW ZEALAND).
Acid Coagulation and Dissolved Air Flotation,
W76-08224 5D

MEDITSINSKII INSTITUT, KIEV (USSR).
Hygienic Substantiation of the Possibility of Wastewater Treatment of Poultry Processing Plants on Underground Filter Beds, (In Russian),
W76-08581 5D

MEE INDUSTRIES, INC., ROSEMEAD, CALIF.
Research and Development of an Airborne Hygroscopic Spray System,
W76-08111 3B

MELBOURNE AND METROPOLITAN BOARD OF WORKS (AUSTRALIA).
Change in Yield of Water Following a Bushfire in a Forest of Eucalyptus Regnans,
W76-08349 4C

MELBOURNE UNIV., PARKVILLE (AUSTRALIA). CENTRE FOR ENVIRONMENTAL STUDIES.
Two-Dimensional Mathematical Water Quality Model,
W76-08135 5B

MEMPHIS STATE UNIV., TENN. DEPT. OF BIOLOGY; AND MEMPHIS STATE UNIV., TENN. ECOLOGICAL RESEARCH CENTER.
Salinity Effects on Plasma Electrolytes of Channel Catfish, Ictalurus Punctatus,
W76-08443 5C

META SYSTEMS, INC., CAMBRIDGE, MASS.
Examination of the Concept and Use of the Standard Project Flood,
W76-08321 8B

METEOROLOGICAL OFFICE, NEW DELHI (INDIA).
Rainfall and Floods in India During 1974 Southwest Monsoon Period,
W76-08732 2B

Extreme Rainfall Studies of the Brahmani, The Burhabalang, The Rushikulya and the Subarnarekha River Catchments,
W76-08733 2B

METEOROLOGICAL OFFICE, POONA (INDIA).
Measurement of Soil Moisture in Poona Black Cotton Soil Using an Infra-Red Moisture Balance,
W76-08734 2G

METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1, COMMERCE CITY, COLO.
Fast Replacement of a Flood-Damaged Interceptor,
W76-08240 8F

MICHIGAN STATE UNIV., HICKORY CORNERS. W. K. KELLOGG BIOLOGICAL STATION.
The Relationship Between Watershed Use and Stream Water Quality,
W76-08282 4D

MICHIGAN UNIV., ANN ARBOR. DEPT. OF CIVIL ENGINEERING.
Transient Aquifer Flows by Characteristics Method,
W76-08513 2F

MICHIGAN UNIV., ANN ARBOR. DEPT. OF NAVAL ARCHITECTURE AND MARINE ENGINEERING.
Fast Current Oil Control Study,
W76-08748 5G

MIDDLE TENNESSEE STATE UNIV., MURFREESBORO. DEPT. OF BIOLOGY.
Adenosine Triphosphatase Activity in Brain, Intestinal Mucosa, Kidney, and Liver Cellular Fractions of the Red-Eared Turtle Following in Vitro Treatment with DDT, DDD, and DDE,
W76-08115 5C

MIDWEST RESEARCH INST., MINNEAPOLIS, MINN. NORTH STAR RESEARCH DIV.
Continued Evaluation of In-Situ-Formed Condensation Polymers for Reverse Osmosis Membranes,
W76-08116 3A

MILWAUKEE SEWERAGE COMMISSION, WIS.
Lake Michigan Gets Help,
W76-08246 5D

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, LOWESTOFT (ENGLAND). FISHERIES RADIOBIOLOGICAL LAB.
Environmental and Public Health Consequences of the Controlled Disposal of Transuranic Elements to the Marine Environment,
W76-08604 5C

A Review of Methods for the Determination of Radioactive and Stable Zirconium in the Marine Environment,
W76-08620 5A

A Review of Methods for the Determination of Radioactive and Stable Silver in the Marine Environment,
W76-08621 5A

A Review of Methods for the Determination of Iodine-131 in the Marine Environment,
W76-08622 5A

A Study of the Stability of Some Radionuclides in Seawater,
W76-08625 5A

MISSISSIPPI STATE UNIV., STATE COLLEGE. DEPT. OF AGRONOMY.
Calculating the Unsaturated Hydraulic Conductivity and Diffusivity,
W76-08142 2G

MOBIL OIL CORP., EAST CHICAGO, IND.
Waste Water Recycled For Use in Refinery Cooling Towers,
W76-08270 5D

MOSCOW STATE UNIV. (USSR). DEPT. OF ICHTHYOLOGY.
Some Characteristics of Fat Metabolism in Two Forms of Char Salvelinus Alpinus (L.) From Lake Azabach (Kamchatka), (In Russian),
W76-08310 2H

Role of Far Eastern Herbivorous Fish in Ecosystems of Natural Water Bodies Used for Acclimatization, (In Russian),
W76-08666 5C

MOSCOW STATE UNIV. (USSR). FACULTY OF BIOLOGY AND SOIL SCIENCE; AND MOSCOW STATE UNIV. (USSR). DEPT. OF INVERTEBRATE ZOOLOGY.
Method of Studying the Spatial Distribution of Organisms, (In Russian),
W76-08176 7B

MOUNT ROGERS PLANNING DISTRICT COMMISSION, MARION, VA.
Nonparametric Statistical Analysis of Annual Peak Flow Data from a Recently Urbanized Watershed,
W76-08522 4C

MUNICIPALITY OF METROPOLITAN SEATTLE, WASH. WATER QUALITY LAB.
Changes in Blood Chemistry and Blood Cell Morphology in Coho Salmon (Oncorhynchus Kisutch) Following Exposure to Sublethal Levels of Total Residual Chlorine in Municipal Wastewater,
W76-08442 5C

MURRAY STATE UNIV., KY.
An Aquatic Technique for Collecting Small Adult Insects,
W76-08574 7B

NALCO CHEMICAL CO., CHICAGO, ILL.
Economical Foam Control in Wastewater Treatment Systems,
W76-08249 5D

NALCO ENVIRONMENTAL SCIENCES, NORTHBROOK, ILL. PHYSICAL SCIENCE DIV.
Numerical Prediction of Thermal-Regime of Rivers,
W76-08739 5B

NATIONAL ENVIRONMENTAL RESEARCH CENTER, COLLEGE, ALASKA. ARCTIC ENVIRONMENTAL RESEARCH LAB.
Effects of Forest Fertilization on Two Southeast Alaska Streams,
W76-08673 5B

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CORVALLIS, OREG. EUTROPHICATION AND LAKE RESTORATION BRANCH.
A Six-Year Water, Phosphorus, and Nitrogen Budget for Shagawa Lake, Minnesota,
W76-08674 5C

NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D.C.
Evaluation of ERTS Data for Certain Hydrological Uses,
W76-08147 7C

NATIONAL MARINE FISHERIES SERVICE, BEAUFORT, N.C. ATLANTIC ESTUARINE FISHERIES CENTER.
Microbial ATP and Organic Carbon in Sediments of the Newport River Estuary, North Carolina,
W76-08687 5C

NATIONAL MARINE FISHERIES SERVICE, GALVESTON, TEX. GULF COASTAL FISHERIES CENTER.
Abundance of Macrocrustaceans in a Natural Marsh and a Marsh Altered by Dredging, Bulkheading, and Filling,
W76-08435 5C

NATIONAL MARINE FISHERIES SERVICE, LA JOLLA, CALIF. SOUTHWEST FISHERIES CENTER.
Culture and Growth of Northern Anchovy, Engraulis Mordax Larvae,
W76-08432 2L

DDT and its Metabolites in the Sediments off Southern California,
W76-08436 5C

NATIONAL MARINE FISHERIES SERVICE, MILFORD, CONN. MILFORD LAB.
Mercury Concentrations in Fish, North Atlantic Offshore Waters--1971,
W76-08360 5A

NATIONAL MARINE FISHERIES SERVICE, NARRAGANSETT, R. I. NARRAGANSETT LAB.
Effects of Temperature and Salinity on the Survival of Winter Flounder Embryos,
W76-08437 5C

NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH. NORTHWEST FISHERIES CENTER.
Traveling Screens for Turbine Intakes of Hydroelectric Dams,
W76-08647 8I

Fish Diversion Systems and Biological Investigation of Horizontal Traveling Screen Model VII,
W76-08648 8I

Mechanical Operation of Horizontal Traveling Screen Model VII,
W76-08649 8I

Vertical Traveling Fish Basket Collector,
W76-08650 8I

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ANN ARBOR, MICH. GREAT LAKES ENVIRONMENTAL LAB.
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W76-08141 2H

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Water Volume Transport and Oscillatory Current Flow Through the Straits of Mackinac,
W76-08128 2H

Eastern Lake Ontario Precipitation Network,
W76-08412 2B

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO. ENVIRONMENTAL RESEARCH LABS.
Measurements of Current Flow During Summer in Lake Huron,
W76-08413 2H

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SEATTLE, WASH. PACIFIC MARINE ENVIRONMENTAL LAB.
A Seabed Drifter Study of Near-Bottom Circulation in North Carolina Shelf Waters,
W76-08350 2L

NATIONAL WATER QUALITY LABORATORY, DULUTH, MINN.
Baseline Concentrations of Polychlorinated Biphenyls and DDT in Lake Michigan Fish, 1971,
W76-08685 5A

NATIONAL WATER WELL ASSOCIATION, COLUMBUS, OHIO.
Ground Water Flow No Longer a Mystery,
W76-08114 2F

NATIONAL WEATHER SERVICE, FORT WORTH, TEX. SOUTHERN REGION.
A Comparison of Manually Digitized Radar Data and Observed Cool Season Precipitation Over the Southern Appalachians,
W76-08414 2B

NATIONAL WEATHER SERVICE SALT LAKE CITY, UTAH. WESTERN REGION.
Application of the National Weather Service Flash-Flood Program in the Western Region,
W76-08415 4A

NAUCHNO-ISSLEDOVATELSKII INSTITUT EPIDEMIOLOGII, MIKROBIOLOGII I GIGIENY, VILNIUS (USSR).
Bacterial Contamination of Perennial Grasses in Overhead Irrigation with Sewage, (In Russian),
W76-08582 5D

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Updating the Navy Environmental Protection Data Base to Incorporate Oil Spill Clean-Up Performance,
W76-08320 5B

NEBRASKA UNIV., LINCOLN.
Pollution of Surface Irrigation Waters by Plant Pathogenic Organisms,
W76-08230 5B

NEVADA UNIV., RENO. DESERT RESEARCH INST.
Pyramid Lake: Zooplankton Distribution and Blooms of the Blue Green Alga, Nodularia spumigena,
W76-08374 5C

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRONOMY.
Transfer of Boron and Tritiated Water Through Sandstone,
W76-08547 5B

NEW YORK CITY-RAND INST., N.Y.
A Water-Quality Simulation Model for Well Mixed Estuaries and Coastal Seas: Vol. VII, A Hindcast,
W76-08317 5B

NEW YORK OPERATIONS OFFICE (AEC), N. Y. HEALTH AND SAFETY DIV.
Quality Control in Radiochemical Analysis,
W76-08609 5A

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA.
Reduction in Oxygen Demand of Abattoir Effluent by Precipitation with Metal,
W76-08169 5D

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA. DEPT. OF FOOD SCIENCE AND TECHNOLOGY.
Dry Caustic Peeling of Beets and Carrots Reduces Pollution,
W76-08504 5D

NEW YORK UNIV. MEDICAL CENTER, N.Y. INST. OF ENVIRONMENTAL MEDICINE.
Entrainment Studies on Hudson River Organisms,
W76-08633 5C

NORTH CAROLINA STATE UNIV., RALEIGH.
Utilization of ERTS-1 Data in Geological Evaluation, Regional Planning, Forest Management, and Water Management in North Carolina,
W76-08538 4A

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF ECONOMICS.
Use, Continued Use, and Reuse of Both Process and Waste Waters in Poultry Processing Operations,
W76-08299 3E

Water and Waste Management in Poultry Processing,
W76-08428 3E

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Response of Phytoplankton to Thermal Stress,
W76-08644 5C

NORTHWEST NUCLEAR POWER ASSOCIATES, SEATTLE, WASH.
A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part II: Design Concept,
W76-08661 8I

NORTHWESTERN UNIV., EVANSTON, ILL. TECHNOLOGICAL INST.
Water Quality Effects of a Dredging Disposal Area,
W76-08749 5C

NORWEGIAN WATER RESOURCES AND ELECTRICITY BOARD, OSLO.
Evaluation of Glacier Mass Balance by Observing Variations in Transient Snowline Positions,
W76-08322 2C

NUS CORP., PITTSBURGH, PA. CYRUS WM. RICE DIV.
Vulnerability and Survival of Young Connecticut River Fish Entrained at a Nuclear Power Plant,
W76-08656 8I

OAK RIDGE NATIONAL LAB., TENN.
Interaction of Plutonium with Complexing Substances in Soils and Natural Waters,
W76-08605 5B

Evaluation of Entrainment Effect,
W76-08629 8I

OAK RIDGE NATIONAL LAB., TENN. ECOLOGICAL SCIENCES INFORMATION CENTER.
Chemistry and Effects of Chlorine in Aquatic Systems, A Selected, Annotated Bibliography,
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OCEAN-ATMOSPHERE RESEARCH INST., CAMBRIDGE, MASS.
On a Thermal Lag in the North Atlantic Ocean During a Climatic Change,
W76-08127 2L

OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER, N'DJAMENA (CHAD). CENTRE (ORSTOM) DE N'DJAMENA.
The Selection of Prey in 3 Malacophagous Fishes of Lake Chad, (In French),
W76-08178 2H

OFFICE OF THE SECRETARY (NAVY). WASHINGTON, D. C.
Coanda Effect Oil-Water Separator,
W76-08209 5G

OFFSHORE DEVICES, INC., LYNN, MASS. (ASSIGNEE).
Floating Oil Barrier,
W76-08396 5G

OHIO STATE UNIV. COLUMBUS. DEPT. OF AGRICULTURAL ENGINEERING.
Nutrient and Sediment Characteristics of Tile Effluent in Ohio,
W76-08121 5B

OLD DOMINION UNIV., NORFOLK, VA.
Laser Applications to Atmospheric Sciences - A Bibliography,
W76-08323 10C

OLD DOMINION UNIV., NORFOLK, VA. INST. OF OCEANOGRAPHY.
Field Performance of Permeable Breakwater,
W76-08684 8A

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The Water Pollution Control Act of 1972 Institutional Assessment, Attitudes of Participants.
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OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL AND RESOURCE ECONOMICS.
Economic Evaluation of Proposed Water Conservation Practices on Established Irrigation Districts: A General Methodology and Application to Three Districts in Oregon,
W76-08431 3F

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Chlorinated Pesticides and Polychlorinated Biphenyls in Marine Species, Oregon/Washington Coast, 1972,
W76-08359 5A

OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY.
Ekman Veering Observed Near the Ocean Bottom,
W76-08129 2L

Dense Effluent Dispersion in a Stream,
W76-08316 5B

Some Three-Dimensional Characteristics of Low-Frequency Current Fluctuations Near the Oregon Coast,
W76-08336 2L

Oregon Coast Shoreline Changes Due to Jetties,
W76-08342 8B

A Physical Model for the Rate of Deposition of Fine-Grained Sediments in the Deep Sea,
W76-08736 2J

OSMONICS, INC., HOPKINS, MINN.
Reverse Osmosis System Corrects High BOD Wastes: Yields Net Operating Savings,
W76-08486 5D

OTAGO UNIV., DUNEDIN (NEW ZEALAND). DEPT. OF MICROBIOLOGY.
Passage of Metals in Effluents, Through Bacteria to Higher Organisms,
W76-08449 5B

OXY METAL INDUSTRIES (INTRA) INC., SANTA ANA, CALIF. SYSTEMS ENGINEERING DIV.
Research on Ultrafiltration Systems Under Seawater Desalting Conditions,
W76-08117 3A

PACIFIC GAS AND ELECTRIC CO., EMERYVILLE, CALIF. ENGINEERING RESEARCH DEPT.
Zooplankton Survival in Cooling Water Systems of Four Thermal Power Plants on the California Coast-Interim Report. March 1971-January 1972,
W76-08630 5C

PAPUA AND NEW GUINEA UNIV., PORT MORESBY (NEW GUINEA). DEPT. OF GEOGRAPHY.
Effects of Hydrologic Regime on Magnitude and Frequency of Dominant Discharge,
W76-08514 2E

PARIS-7 UNIV. (FRANCE). LABORATOIRE DE PHYSIOLOGIE CELLULAR VEGETALE.
The Effects of Lindane on the Morphology and the Growth of Some Unicellular Organisms, (In French),
W76-08676 5C

PASSAVANT-WERKE, MICHELBACH (WEST GERMANY). MICHELBACHERHUTTE. (ASSIGNEE).
Apparatus for Continuous Dewatering of Aqueous Suspensions,
W76-08202 5D

PATRAS UNIV. (GREECE). SCHOOL OF CIVIL ENGINEERING.
Dimensionless Solution of Dam-Break Flood Waves,
W76-08343 8B

PENN PACKING CO., PHILADELPHIA, PA.
Changing Hog Hair from Costly Nuisance to Asset.
W76-08297 5D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRICULTURAL ENGINEERING.
Graphic Determination of Sub-Main Pipe Size for Solid-Set Sprinkler Irrigation on Steep, Non-Uniform Slopes,
W76-08682 3F

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. INST. FOR RESEARCH ON LAND AND WATER RESOURCES.
Use of Crushed Limestone to Neutralize Acid Wastes,
W76-08225 5G

PHILADELPHIA WATER DEPT., PA. NORTHEAST WATER POLLUTION CONTROL PLANT.
New Incineration Method Solves Grease Problem in Richmond, Pa.,
W76-08485 5E

PITTSBURGH UNIV., PA. DEPT. OF CIVIL ENGINEERING.
Simulation of Hydraulic Processes in Open Channels,
W76-08344 8B

POLISH ACADEMY OF SCIENCES, GOLYSZ. FISH CULTURE STATION.
The Effect of Controlled Eutrophication on Solar Radiation Penetrating into Ponds, (In Polish),
W76-08305 5C

PORTLAND GENERAL ELECTRIC COMPANY, PORTLAND, OREGON, DEPARTMENT OF ENVIRONMENTAL SERVICES.
Adaptation of Hydro Fish Facilities to Steam-Electric Stations,
W76-08654 8I

POTCHEFSTROOM UNIV. FOR CH. H. E. (SOUTH AFRICA). INST. OF DIERKUNDIGE NAVORSING.
Energy Content of the Benthos and Epifauna in the Pongola River, Natal, (In Afrikaans),
W76-08158 2I

POULTRY AND EGG INST. OF AMERICA, WASHINGTON, D.C.
Wastewater Control at Egg Products Plants, Pt. 1-3.
W76-08291 3E

PREIN AND NEWHOF, CONSULTING ENGINEERS, GRAND RAPIDS, MICH.
Combined Treatment of Leather Tanning and Municipal Wastes at Grand Haven, Michigan,
W76-08294 5D

PURDUE UNIV., LAFAYETTE, IND. AGRICULTURAL EXPERIMENT STATION.
Evaluation of Methods for Preserving the Levels of Soluble Inorganic Phosphorus and Nitrogen in Unfiltered Water Samples,
W76-08157 5A

PURDUE UNIV., LAFAYETTE, IND. DEPT. OF AGRICULTURAL ENGINEERING.
Use and Misuse of the Universal Soil Loss Equation,
W76-08120 2J

PURDUE UNIV., LAFAYETTE, IND. DEPT. OF AGRONOMY.
Determination of Total Nitrogen in Natural Waters,
W76-08355 2K

PURDUE UNIV., LAFAYETTE, IND. JOINT HIGHWAY RESEARCH PROJECT.
Pore Size Distribution of Compacted Soils After Critical Region Drying,
W76-08416 2G

QUEBEC UNIV., RIMOUSKI. DEPT. OF OCEANOGRAPHY.
Surface Circulation Pattern in the Gulf of St. Lawrence,
W76-08126 2L

QUEEN'S UNIV., KINGSTON (ONTARIO). DEPT. OF GEOGRAPHY.
Sediment Yields and Nutrient Loadings from Canadian Watersheds Tributary to Lake Erie: An Overview,
W76-08529 5B

RENSSELAER POLYTECHNIC INST., TROY, N. Y. DEPT. OF CHEMICAL ENGINEERING; AND RENSSELAER POLYTECHNIC INST., TROY, N. Y. DEPT. OF ENVIRONMENTAL ENGINEERING.
Factors Affecting the Contribution by Epiphytic Algae to the Primary Productivity of an Oligotrophic Freshwater Lake,
W76-08357 5C

RESEARCH INST. FOR WATER RESOURCES DEVELOPMENT, BUDAPEST (HUNGARY).
Estimation by Digital Computer of the Drawdown Caused by Groundwater Withdrawal,
W76-08140 4B

RHODE ISLAND UNIV., KINGSTON, GRADUATE SCHOOL OF OCEANOGRAPHY.
Suspended Material Transport: Narragansett Bay Area, Rhode Island,
W76-08139 2L

Seasonal Studies on the Relative Importance of Different Size Fractions of Phytoplankton in Narragansett Bay (USA),
W76-08686 5C

RHODES UNIV., GRAHAMSTOWN (SOUTH AFRICA). LEATHER INDUSTRIES RESEARCH INST.
No-Effluent Tannery Processes,
W76-08182 3E

ROBERT A. TAFT SANITARY ENGINEERING CENTER, CINCINNATI, OHIO.
Duck-Processing Waste,
W76-08168 3E

Wastes from the Poultry Processing Industry,
W76-08292 3E

ROBERT S. KERR ENVIRONMENTAL RESEARCH LAB., ADA, OKLA.
Paunch Handling and Processing Techniques,
W76-08173 3E

Comparison of Two Predictive Nonequilibrium One-Dimensional Models for Phosphorus Sorption and Movement Through Homogeneous Soils,
W76-08677 5B

ROYAL VETERINARY AND AGRICULTURE COLL., COPENHAGEN (DENMARK).
A Model for Estimating Actual Evapotranspiration from Potential Evapotranspiration,
W76-08132 2D

ROYAL VETERINARY AND AGRICULTURE COLL., COPENHAGEN (DENMARK). HYDROTECHNICAL LAB.
Effect of Solar Energy and Water on Plant Productivity (In Bulgarian),
W76-08576 2I

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF ZOOLOGY; AND RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF PHYSIOLOGY.
Optical Malformations Induced by Insecticides in Embryos of the Atlantic Silversides, Menidia Menidia,
W76-08445 5C

SAGAMI CHEMICAL RESEARCH CENTER, SAGAMIHARA (JAPAN).
A Study on Marine Trace Elements and CSK Standards, (In Japanese),
W76-08311 2L

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Biological Changes in the South St. Paul Sewage Treatment Plant Before and After Treatment with FeCl3 and Nalcolyte 675 Coagulating Agents,
W76-08290 5D

SAINT MARY'S UNIV., HALIFAX (NOVA SCOTIA).
Kraft Effluent Treatment by Flotation,
W76-08463 5D

SARGENT AND LUNDY, CHICAGO, ILL.
Radial Dispersion Through Adsorbing Porous Media,
W76-08512 5B

SCOTT PAPER CO., PHILADELPHIA, PA. (ASSIGNEE).
Recovery and Separation of Chemicals Produced During Kraft Pulping Operations,
W76-08467 5D

SHEFFIELD UNIV. (ENGLAND), DEPARTMENT OF GEOGRAPHY.
The Significance and Variation of Atmospheric Nutrient Inputs in a Small Catchment System,
W76-08728 5A

SHERWOOD MEDICAL INDUSTRIES, INC., WATERBURY, CONN.
Industrial Waste Treatment System Reduces Pollution,
W76-08711 5D

SIR GEORGE WILLIAMS UNIV., MONTREAL (QUEBEC). DEPT. OF BIOLOGICAL SCIENCES; AND SIR GEORGE WILLIAMS UNIV., MONTREAL (QUEBEC). WATER POLLUTION RESEARCH LAB.
The Toxicity of Various Mining Flotation Reagents to Rainbow Trout (Salmo Gairdneri),
W76-08448 5C

SKELLY AND LOY, HARRISBURG, PA.
Mine Drainage Pollution Watershed Survey, Cherry Creek, Casselman River Watersheds, Garrett County, Maryland.
W76-08386 5B

SKELLY AND LOY, HARRISBURG, PA.; AND ZOLLMAN ASSOCIATES, INC., BALTIMORE, MD.
Preparation of Plans and Specifications for Pollution Abatement Activities in Cherry Creek Watershed, Maryland.
W76-08385 5G

SMITHSONIAN INSTITUTION, ROCKVILLE, MD. RADIATION BIOLOGY LAB.
Phosphorus Flux and Cycling in Estuaries,
W76-08689 5C

SOIL CONSERVATION SERVICE, UPPER DARBY, PA. ENGINEERING DIV.
Urban Hydrology for Small Watersheds.
W76-08509 4D

SOUTH CAROLINA UNIV., COLUMBIA, COLL. OF ENGINEERING.
Investigation of Roadway Drainage as Related to the Performance of Flexible Pavements,
W76-08534 8B

SOUTH DAKOTA STATE UNIV., BROOKINGS.
Egg-Processing Plant Wastes,
W76-08170 3E

SOUTHWESTERN GREAT PLAINS RESEARCH CENTER, BUSHLAND, TEX.
Limited Irrigation of Grain Sorghum in Alternating Strips with Wheat,
W76-08542 3F

Deep Tillage of Graded-Furrow-Irrigated Pullman Clay Loam,
W76-08543 3F

SSP AGRICULTURAL EQUIPMENT, INC., BURBANK, CALIF. (ASSIGNEE).
Moisturizing Apparatus for Use with Wind Machines,
W76-08399 3F

STANFORD RESEARCH INST., MENLO PARK, CALIF.
Recycling of Water in Poultry Processing Plants,
W76-08298 3E

STATE UNIV. OF NEW YORK, STONY BROOK. DEPT. OF ECONOMICS.
Optimal Pollution Control and Trade in Collective Goods,
W76-08367 5G

STUTTGART UNIV. (WEST GERMANY). OTTO-GRAF-INSTITUT.
Schriftenreih, (Otto-Graf-Institut), (In German).
W76-08425 8D

SWEDISH METEOROLOGICAL AND HYDROLOGICAL INST., STOCKHOLM.
The Development of a Snow Routine for the HBV-2 Model,
W76-08338 2C

SWEDISH NATURAL SCIENCE RESEARCH COUNCIL, STOCKHOLM.
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W76-08130 2L

TASHKENT AGRICULTURAL ACADEMY (USSR).
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W76-08583 2D

TASHKENT UNIV. (USSR).
Some Problems of the Ecology of the Sary-Chilek Marinka Schizothorax Intermedius Eury-Cephalus Spelter, (In Russian),
W76-08243 2H

TASMANIAN COLL. OF ADVANCED EDUCATION, LAUNCESTON.
Natural and Agricultural Ecosystems,
W76-08667 6G

TECHNISCHE HOCHSCHULE, DARMSTADT (WEST GERMANY). INSTITUT FUER MAKROMOLEKULARE CHEMIE.
A Very Rapid Liming and Tanning Process Without Effluent,
W76-08181 3E

TETRA TECH, INC., PASADENA, CALIF.
Three-Dimensional Pollutant Modeling in Shear Flow,
W76-08740 5B

TEXACO, INC., NEW YORK. (ASSIGNEE).
Process for Treating Water-Soluble Organic Wastes,
W76-08482 5D

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF WILDLIFE AND FISHERIES SCIENCES.
Weight Loss, Mortality, Feeding, and Duration of Residence of Adult American Shad, Alosa Sapidissima in Fresh Water,
W76-08433 5C

Numbers of Individuals and Injury Rates of Fishes Caught on Revolving Screens at the P. H. Robinson Generating Station,
W76-08653 8I

TEXAS CHRISTIAN UNIV., FORT WORTH. DEPT. OF BIOLOGY.
A Simple Continuous-Flow Respirometer for Comparative Respiratory Changes in Medium-Sized Aquatic Organisms,
W76-08353 5C

TEXAS PARKS AND WILDLIFE DEPT., SEABROOK. SEABROOK MARINE LAB.
Causes and Probably Correctives for Oxygen Depletion Fish Kills in the Dickinson Bayou Estuary: A Field Study and Simplified Algal Assay,
W76-08690 5C

TEXAS TECH UNIV., LUBBOCK. DEPT. OF POLITICAL SCIENCE.
Attitudes and Public Participation on the High Plains Toward Groundwater Planning and Management Institutions,
W76-08375 6B

TEXAS TECH UNIV., LUBBOCK. WATER RESOURCES CENTER.
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W76-08278 5B

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W76-08279 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 3 - Analysis of Flow Models,
W76-08280 2A

Variation of Urban Runoff Quality and Quantity with Duration and Intensity of Storms - Phase III, Volume 4 - Project Summary,
W76-08281 5B

TEXAS UNIV. AT AUSTIN. DEPT. OF ELECTRICAL ENGINEERING.
Shooting Models for Salinity and Coliform,
W76-08134 5B

THIOKOL CORP., NEWTOWN, PA. (ASSIGNEE).
Catalytic Filtering-Incinerating Process and Device for Waste Water,
W76-08400 5D

TOKYO UNIV. (JAPAN). INST. OF APPLIED MICROBIOLOGY.
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W76-08309 5D

TOKYO UNIV. (JAPAN). OCEAN RESEARCH INST.
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W76-08232 2L

TOUCHE, ROSS AND CO., WASHINGTON, D. C.
Water Pollution Control Act of 1972, Institutional Assessment, Construction Grants.
W76-08194 5G

TRINITY COLL., CAMBRIDGE (ENGLAND).
Suppression of Waves in Slotted-Walled Channel,
W76-08742 8B

TSENTRALNYI GOSUDARSTVENNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT OZERNOGO I RECHNOGO RYBNOGO KHOZYAISTVA, BAKU (USSR). AZERBAIJAN BRANCH.
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W76-08552 5C

UDAIPUR UNIV. (INDIA). COLL. OF AGRICULTURE.
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W76-08301 3C

UNIVERSAL OIL PRODUCTS CO., SAN DIEGO, CALIF. FLUID SYSTEMS DIV.
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W76-08283 3A

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W76-08245 2L

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W76-08743 5B

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W76-08302 5C

Methane Fermentation of Rubber (Hevea Brasiliensis) Latex Effluent,
W76-08722 5D

UNIVERSITY OF SOUTH FLORIDA, ST. PETERSBURG, FLA.
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W76-08434 5C

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Water Temperature Variations Within a Major River System,
W76-08340 2E

USSR AKADEMIYA NAUK URSR, KIEV. INSTYTUT GEOLOGICHNYKH NAUK.
The Effect of Forest Stands on the Water Content of Rocks of the Loess Cover in the Western Regions of the Northern Black Sea Area, (In Ukranian),
W76-08303 4A

VIRGIN ISLANDS DEPT. OF PUBLIC WORKS.
Rum Distillery Wastes: Laboratory Studies on Aerobic Treatment,
W76-08469 5D

VOLKSEIGENER BETRIEBSFESTIGKEIT WASSERVERSORGUNG UND ABWASSERBEHANDLUNG, ROSTOCK (EAST GERMANY).
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W76-08105 2H

The Effect of Mineral Environment on the Geohydrological Situation in Low Bog Sites, (In German),
W76-08184 2H

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W76-08515 2A

VYSOKA SKOLA CHEMICKO-TECHNOLOGICKA, PRAGUE (CZECHOSLOVAKIA). DEPT. OF WATER TECHNOLOGY.
Determination of Biological Degradability of Organic Substances,
W76-08351 5B

VYZKUMNY USTAV VODOHOSPODARSKY, PRAGUE (CZECHOSLOVAKIA).
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W76-08627 5A

WAHLER (W. A.) AND ASSOCIATES, PALO ALTO, CALIF.
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W76-08741 2L

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W76-08737 2L

WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.
Fish Passage Through Turbines, Conduits, and Spillway Gates,
W76-08651 8I

A High Capacity Sand Filter for Thermal Power Plant Cooling Water Intakes Part I: Model Studies and Fouling Control Techniques,
W76-08660 8I

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
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W76-08180 5D

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W76-08277 5D

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W76-08220 5G

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W76-08273 5A

WATER RESOURCES ENGINEERS, INC., WALNUT CREEK, CALIF.
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W76-08411 5B

WEST VIRGINIA UNIV., MORGANTOWN. DIV. OF PLANT SCIENCES.
Effects of Grazing on Infiltration Rates in Waste Water Spray Fields,
W76-08352 5E

WESTERN ELECTRIC CO., INC., ALLENTOWN, PA. PLANT ENGINEERING DEPT.
Updating an Existing Pollution Control Facility at Western Electric,
W76-08477 5D

WESTERN SCIENTIFIC SERVICES, INC., FORT COLLINS, COLO.
Development of an Experimental Hydrometeorological Data Collection Network,
W76-08694 2B

WESTINGHOUSE ELECTRIC CORP., PHILDELPHIA, PA. ENVIRONMENTAL SYSTEMS. DEPT.
Preliminary Studies on the Effects of Air Bubbles and Intense Illumination on the Swimming Behavior of the Striped Bass (Morone Saxitalis) and the Gizzard Shad (Dorosoma Cepedianum),
W76-08658 8I

WESTVACO CORP., NEW YORK. (ASSIGNEE).
Decolorizing Method for Waste Kraft Paper Mill Effluents,
W76-08207 5D

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W76-08438 5C

WISCONSIN UNIV., MADISON. LAB. OF LIMNOLOGY.

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W76-08439 5C

WISCONSIN UNIV. OSHKOSH. DEPT. OF GEOLOGY.

Hydrogeology of the South Fork of Long Island, New York,
W76-08347 2F

WISE (HAROLD F.) AND ASSOCIATES, WASHINGTON, D. C.

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W76-08192 5G

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.

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W76-08602 5B

Comparison of the Distributions in Marine Sediments of the Fallout Derived Nuclides Fe 55 and Pu 239,240, A New Approach to the Chemistry of Environmental Radionuclides,
W76-08603 5B

Double-Tracer Studies to Optimize Conditions for the Radiochemical Separation of Plutonium from Large Seawater Samples,
W76-08610 5A

A Procedure for Analysis of Amercium in Marine Environmental Samples,
W76-08611 5A

Summary of Entrainment Research at the Millstone Point Nuclear Power Station, 1970 to 1972,
W76-08632 5C

WYOMING UNIV., LARAMIE. DEPT. OF GEOLOGY.

Analysis of ERTS-1 Imagery of Wyoming and its Application to Evaluation of Wyoming's Natural Resources,
W76-08535 4A

ACCESSION NUMBER INDEX

W76-08101	6B	W76-08179	5D	W76-08257	5D	W76-08335	2F
W76-08102	6B	W76-08180	5D	W76-08258	5B	W76-08336	2L
W76-08103	3D	W76-08181	3E	W76-08259	2C	W76-08337	2L
W76-08104	5G	W76-08182	3E	W76-08260	5C	W76-08338	2C
W76-08105	2H	W76-08183	5D	W76-08261	5A	W76-08339	2A
W76-08106	2L	W76-08184	2H	W76-08262	5D	W76-08340	2E
W76-08107	5C	W76-08185	3E	W76-08263	5D	W76-08341	2L
W76-08108	4C	W76-08186	5G	W76-08264	5D	W76-08342	8B
W76-08109	4A	W76-08187	5G	W76-08265	5D	W76-08343	8B
W76-08110	4A	W76-08188	5G	W76-08266	5F	W76-08344	8B
W76-08111	3B	W76-08189	5G	W76-08267	5D	W76-08345	5B
W76-08112	8C	W76-08190	5G	W76-08268	5D	W76-08346	5A
W76-08113	8B	W76-08191	5G	W76-08269	5D	W76-08347	2F
W76-08114	2F	W76-08192	5G	W76-08270	5D	W76-08348	2B
W76-08115	5C	W76-08193	5G	W76-08271	5D	W76-08349	4C
W76-08116	3A	W76-08194	5G	W76-08272	5D	W76-08350	2L
W76-08117	3A	W76-08195	5G	W76-08273	5A	W76-08351	5B
W76-08118	3A	W76-08196	3F	W76-08274	5D	W76-08352	5E
W76-08119	3A	W76-08197	3F	W76-08275	5A	W76-08353	5C
W76-08120	2J	W76-08198	5G	W76-08276	5A	W76-08354	5C
W76-08121	5B	W76-08199	3A	W76-08277	5D	W76-08355	2K
W76-08122	4A	W76-08200	5F	W76-08278	5B	W76-08356	5B
W76-08123	2F	W76-08201	5D	W76-08279	2A	W76-08357	5C
W76-08124	2F	W76-08202	5D	W76-08280	2A	W76-08358	5C
W76-08125	2L	W76-08203	5D	W76-08281	5B	W76-08359	5A
W76-08126	2L	W76-08204	4B	W76-08282	4D	W76-08360	5A
W76-08127	2L	W76-08205	8C	W76-08283	3A	W76-08361	5A
W76-08128	2H	W76-08206	5D	W76-08284	3A	W76-08362	4C
W76-08129	2L	W76-08207	5D	W76-08285	3E	W76-08363	5D
W76-08130	2L	W76-08208	5D	W76-08286	5D	W76-08364	2G
W76-08131	2E	W76-08209	5G	W76-08287	5D	W76-08365	5B
W76-08132	2D	W76-08210	5F	W76-08288	3E	W76-08366	8C
W76-08133	5B	W76-08211	3A	W76-08289	5D	W76-08367	5G
W76-08134	5B	W76-08212	8I	W76-08290	5D	W76-08368	2I
W76-08135	5B	W76-08213	8I	W76-08291	3E	W76-08369	5D
W76-08136	2H	W76-08214	8I	W76-08292	3E	W76-08370	3A
W76-08137	8I	W76-08215	8I	W76-08293	5D	W76-08371	2I
W76-08138	2C	W76-08216	8I	W76-08294	5D	W76-08372	3A
W76-08139	2L	W76-08217	8I	W76-08295	5D	W76-08373	3A
W76-08140	4B	W76-08218	8I	W76-08296	2L	W76-08374	5C
W76-08141	2H	W76-08219	8I	W76-08297	5D	W76-08375	6B
W76-08142	2G	W76-08220	5G	W76-08298	3E	W76-08376	4A
W76-08143	5G	W76-08221	5G	W76-08299	3E	W76-08377	4A
W76-08144	8B	W76-08222	5G	W76-08300	3E	W76-08378	4A
W76-08145	7B	W76-08223	5D	W76-08301	3C	W76-08379	4A
W76-08146	8C	W76-08224	5D	W76-08302	5C	W76-08380	4A
W76-08147	7C	W76-08225	5G	W76-08303	4A	W76-08381	4A
W76-08148	3B	W76-08226	5G	W76-08304	3F	W76-08382	6B
W76-08149	2C	W76-08227	3D	W76-08305	5C	W76-08383	2C
W76-08150	5G	W76-08228	4A	W76-08306	2I	W76-08384	5G
W76-08151	5G	W76-08229	7B	W76-08307	3F	W76-08385	5G
W76-08152	6B	W76-08230	5B	W76-08308	2H	W76-08386	5B
W76-08153	4A	W76-08231	5D	W76-08309	5D	W76-08387	5C
W76-08154	6B	W76-08232	2L	W76-08310	2H	W76-08388	4A
W76-08155	5G	W76-08233	5F	W76-08311	2L	W76-08389	4A
W76-08156	5G	W76-08234	8G	W76-08312	5C	W76-08390	4A
W76-08157	5A	W76-08235	8G	W76-08313	5A	W76-08391	5D
W76-08158	2I	W76-08236	8F	W76-08314	5C	W76-08392	8C
W76-08159	5C	W76-08237	8F	W76-08315	5C	W76-08393	3F
W76-08160	5B	W76-08238	2A	W76-08316	5B	W76-08394	5D
W76-08161	2L	W76-08239	4B	W76-08317	5B	W76-08395	5D
W76-08162	5C	W76-08240	8F	W76-08318	8B	W76-08396	5G
W76-08163	9D	W76-08241	7B	W76-08319	2L	W76-08397	2B
W76-08164	5D	W76-08242	5D	W76-08320	5B	W76-08398	3F
W76-08165	5D	W76-08243	2H	W76-08321	8B	W76-08399	3F
W76-08166	3E	W76-08244	5C	W76-08322	2C	W76-08400	5D
W76-08167	5D	W76-08245	2L	W76-08323	10C	W76-08401	5D
W76-08168	3E	W76-08246	5D	W76-08324	5A	W76-08402	5D
W76-08169	5D	W76-08247	5C	W76-08325	5G	W76-08403	5G
W76-08170	3E	W76-08248	5D	W76-08326	4A	W76-08404	5D
W76-08171	3E	W76-08249	5D	W76-08327	5B	W76-08405	5C
W76-08172	5D	W76-08250	8C	W76-08328	2L	W76-08406	3F
W76-08173	3E	W76-08251	8C	W76-08329	5B	W76-08407	3F
W76-08174	5D	W76-08252	5A	W76-08330	3B	W76-08408	5D
W76-08175	5D	W76-08253	5D	W76-08331	3C	W76-08409	5D
W76-08176	7B	W76-08254	5A	W76-08332	2K	W76-08410	2I
W76-08177	5D	W76-08255	2I	W76-08333	2F	W76-08411	5B
W76-08178	2H	W76-08256	5A	W76-08334	2G	W76-08412	2B

W76-08413 2H
W76-08414 2B
W76-08415 4A
W76-08416 2G
W76-08417 8D
W76-08418 8E
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W76-08431 3F
W76-08432 2L
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W76-08496 5D
W76-08497 5D
W76-08498 5D
W76-08499 5A
W76-08500 5D
W76-08501 5A
W76-08502 5D
W76-08503 5D
W76-08504 5D
W76-08505 5D
W76-08506 5D
W76-08507 7C
W76-08508 5B
W76-08509 4D
W76-08510 2C
W76-08511 8B
W76-08512 5B
W76-08513 2F
W76-08514 2E
W76-08515 2A
W76-08516 2G
W76-08517 4B
W76-08518 8B
W76-08519 4A
W76-08520 2F
W76-08521 2I
W76-08522 4C
W76-08523 2A
W76-08524 2L
W76-08525 2L
W76-08526 5B
W76-08527 5B
W76-08528 5B
W76-08529 5B
W76-08530 5B
W76-08531 5B
W76-08532 5A
W76-08533 4D
W76-08534 8B
W76-08535 4A
W76-08536 6B
W76-08537 4A
W76-08538 4A
W76-08539 3B
W76-08540 2J
W76-08541 3F
W76-08542 3F
W76-08543 3F
W76-08544 3F
W76-08545 2G
W76-08546 5G
W76-08547 5B
W76-08548 4A
W76-08549 3F
W76-08550 3C
W76-08551 2J
W76-08552 5C
W76-08553 3F
W76-08554 2K
W76-08555 4A
W76-08556 7C
W76-08557 7C
W76-08558 4A
W76-08559 2J
W76-08560 2J
W76-08561 5B
W76-08562 5A
W76-08563 4B
W76-08564 2H
W76-08565 2H
W76-08566 2H
W76-08567 2H
W76-08568 4B
W76-08569 4B
W76-08570 4B
W76-08571 4B
W76-08572 4A
W76-08573 2D
W76-08574 7B
W76-08575 2I
W76-08576 2I
W76-08577 5C
W76-08578 5D
W76-08579 5F
W76-08580 5D
W76-08581 5D
W76-08582 5D
W76-08583 2D
W76-08584 3A
W76-08585 2D
W76-08586 2D
W76-08587 2D
W76-08588 2D
W76-08589 2D
W76-08590 2D
W76-08591 2D
W76-08592 5C
W76-08593 5C
W76-08594 5C
W76-08595 5G
W76-08596 5B
W76-08597 5C
W76-08598 5C
W76-08599 5C
W76-08600 5C
W76-08601 5C
W76-08602 5B
W76-08603 5B
W76-08604 5C
W76-08605 5B
W76-08606 5C
W76-08607 5B
W76-08608 5A
W76-08609 5A
W76-08610 5A
W76-08611 5A
W76-08612 5A
W76-08613 5A
W76-08614 5A
W76-08615 5A
W76-08616 5A
W76-08617 5A
W76-08618 5A
W76-08619 5A
W76-08620 5A
W76-08621 5A
W76-08622 5A
W76-08623 5A
W76-08624 5A
W76-08625 5A
W76-08626 5A
W76-08627 5A
W76-08628 8I
W76-08629 8I
W76-08630 5C
W76-08631 5C
W76-08632 5C
W76-08633 5C
W76-08634 5C
W76-08635 5C
W76-08636 5C
W76-08637 5C
W76-08638 5C
W76-08639 5C
W76-08640 5C
W76-08641 5C
W76-08642 5C
W76-08643 5C
W76-08644 5C
W76-08645 5C
W76-08646 5C
W76-08647 8I
W76-08648 8I
W76-08649 8I
W76-08650 8I
W76-08651 8I
W76-08652 8I
W76-08653 8I
W76-08654 8I
W76-08655 8I
W76-08656 8I
W76-08657 8I
W76-08658 8I
W76-08659 8I
W76-08660 8I
W76-08661 8I
W76-08662 8I
W76-08663 8I
W76-08664 5C
W76-08665 2I
W76-08666 5C
W76-08667 6G
W76-08668 2I
W76-08669 4A
W76-08670 2G
W76-08671 5B
W76-08672 5B
W76-08673 5B
W76-08674 5C
W76-08675 5B
W76-08676 5C
W76-08677 5B
W76-08678 5B
W76-08679 5B
W76-08680 5B
W76-08681 5D
W76-08682 3F
W76-08683 5B
W76-08684 8A
W76-08685 5A
W76-08686 5C
W76-08687 5C
W76-08688 5C
W76-08689 5C
W76-08690 5C
W76-08691 5C
W76-08692 5D
W76-08693 5D
W76-08694 2B
W76-08695 5D
W76-08696 5D
W76-08697 2H
W76-08698 5D
W76-08699 5D
W76-08700 5D
W76-08701 5D
W76-08702 5D
W76-08703 5D
W76-08704 5D
W76-08705 5D
W76-08706 5D
W76-08707 5D
W76-08708 5D
W76-08709 5D
W76-08710 5D
W76-08711 5D
W76-08712 5D
W76-08713 5D
W76-08714 5D
W76-08715 5D
W76-08716 5D
W76-08717 5D
W76-08718 5C
W76-08719 5D
W76-08720 5D
W76-08721 5D
W76-08722 5D
W76-08723 2H
W76-08724 2H
W76-08725 2J
W76-08726 2J
W76-08727 2J
W76-08728 5A

W76-08729 2G
W76-08730 5B
W76-08731 8B
W76-08732 2B
W76-08733 2B
W76-08734 2G
W76-08735 2E
W76-08736 2J
W76-08737 2L
W76-08738 5B
W76-08739 5B
W76-08740 5B
W76-08741 2L
W76-08742 8B
W76-08743 5B
W76-08744 8B
W76-08745 2A
W76-08746 5B
W76-08747 8C
W76-08748 5G
W76-08749 5C
W76-08750 2F

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W76-08540--08551 08553, 08667 08669--08675 08677--08682	27
Cornell University, Policy Models for Water Resources Systems	W76-08104 08225--08230	7
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W76-08592--08662	71
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W76-08231 08233--08242 08246 08248--08251 08253--08254 08256--08259 08261--08277 08457--08506 08695--08696 08698--08717 08719--08722	115
Illinois State Water Survey, Hydrology	W76-08120--08149 08163 08316--08350 08507--08520 08522--08538 08723--08750	125
University of North Carolina, Metropolitan Water Resources Planning and Management	W76-08114 08376--08382 08384--08390	15
University of Wisconsin, Eutrophication	W76-08157 08159--08162 08351--08360 08362--08363 08365 08683--08691	27
University of Wisconsin, Water Resources Economics	W76-08101--08102 08150--08156 08366--08367	11
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W76-08103 08278--08282 08374--08375 08539, 08585	10

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
Army Engineer Waterways Experiment Station	W76-08416--084277	12
BioSciences Information Service	W76-08105--08107 08158, 08176 08178, 08184 08232 08243--08245 08247, 08252 08255, 08260 08296 08301--08315 08361, 08364 08368, 08371 08383, 08405 08410, 08429 08521, 08552 08574--08583 08663--08666 08668, 08676 08697, 08718	59
Bureau of Reclamation	W76-08111--08113 08431, 08694	5
Effects of Pollutants on Aquatic Life (Katz)	W76-08115 08432--08456	26
Environmental Protection Agency	W76-08164--08175 08177 08179--08183 08185 08223--08224 08285--08295 08297--08300 08428	37
Forest Service (USDA)	W76-08108--08110 08430	4
National Commission on Water Quality	W76-08186--08195 08220--08222	13

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER (CONTINUED)		
National Oceanic and Atmospheric Administration	W76-08411--08415	5
Ocean Engineering Information Service (Patents)	W76-08196--08211 08391--08404 08406--08409	34
Office of Water Research and Technology	W76-08116--08119 08283--08284 08370 08372--08373 08584	10
U. S. Geological Survey	W76-08554--08573	20

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976-210-951/28

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